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OVERSEAS RAILWAYS

SPECIAL NUMBER OF THE RAILWAY GAZETTE

This week there has been issued a Special Number of "The Railway Gazette" devoted entirely to recent progress made by, and current problems affecting, various railways in the Colonies, Dominions, India, and other countries such as Argentina and Brazil where British-owned railways operate or are partly British-officered. This number is additional to the ordinary weekly issue, and has been sent to all annual subscribers. Extra copies, price 2s., may be obtained through any newsagent, or direct from the Publisher, post free, 2s. 6d. For further particulars see Advertisement page 18.

London Railways Fifty Years Hence

A FINER London, though not much larger than the London of today": in these words Mr. Frank Pick, Vice-Chairman of the London Passenger Transport Board, epitomised his views of London fifty years hence, as given in a paper to the Institution of Professional Civil Servants on November 27. For the area qualifying to be described as Greater London, however, he predicted a vast extension. The home counties, and even the coast east as well as south, would in fifty years fall within a one-hour journey of the capital. Already the flow of population outwards that would necessitate such improvement of railway services had amounted to one million persons in the last twenty years, and would continue until the central parts were replanned. To cope with this tendency, all main-line suburban services would be electrified, and fast electric trains would run at regular intervals both on existing lines and transversely as a link between them. New tubes would be constructed for directions of movement across London at present poorly provided for. Discussing reconstruction of main-line termini, Mr. Pick considered that a new King's Cross, covering the sites of the present station and St. Pancras, would balance the rebuilt Euston.

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The Crystal Palace

Famed for its firework displays and crowds, the Crystal Palace came to an appropriate end last Monday night by giving its greatest display and attracting record crowds to see its own destruction by fire. Conceived casually by Sir Joseph Paxton on a piece of blotting paper during a railway enquiry at Derby, and built with the approval of Robert Stephenson for the Great Exhibition of 1851, the Crystal Palace in Hyde Park was the embodiment of the ideal of comity among nations for which Prince Albert valiantly strove. Through the action of a group of public-spirited men, it was moved from Hyde Park to Sydenham in 1854, and recently has been preserved by public subscription. The great glass house, based on Paxton's conservatory at Chatsworth, had come to be regarded by latter-day Londoners as both a landmark and an apotheosis of the now almost legendary spacious days of mid-Victorian times. As a centre of entertainment, especially in the heyday of royal fêtes and Handel Festivals, the Palace drew many hundreds of thousands of visitors, and to accommodate this traffic the old L.B.S.C.R. enlarged its London Bridge terminus and secured powers to extend the Sydenham line to the Palace. The Crystal Palace station—now an anachronism in name—was built almost beneath the great glass halls, and was opened on June 10, 1854, when Queen Victoria and her Consort attended the reopening of the Palace.

* * * *

The Week's Traffics

A net decrease of £45,000 is shown in the traffics of the four group companies for the past week, as compared with a net increase of £22,000 for the previous week. Coal is responsible for £63,000 and merchandise for £8,000 of the decrease. In the corresponding week of 1935, however, there were substantial increases in the coal receipts of the L.M.S.R., L.N.E.R., and Great Western because of fears of a coal strike, and good advances were shown in the merchandise earnings of the L.M.S.R. and L.N.E.R. Passenger train traffics to date show the following percentage increases: L.M.S.R. 2·58, L.N.E.R. 2·08, Great Western 2·10, and Southern 2·10. In merchandise earnings to date the L.M.S.R. has a gain of 5·77 per cent., the L.N.E.R. of 3·20 per cent., and the G.W.R. 4·23 per cent.

	48th Week				Year to date	
	Pass., &c.	Goods, &c.	Coal, &c.	Total	Inc. or Dec.	
	£	£	£	£	£	%
L.M.S.R. ..	+ 11,000	+ 7,000	− 21,000	− 3,000	+ 2,214,000	+ 3·94
L.N.E.R. ..	− 3,000	− 17,000	− 19,000	− 39,000	+ 1,189,000	+ 2·89
G.W.R. ..	+ 10,000	+ 5,000	− 13,000	+ 2,000	+ 602,000	+ 2·56
S.R. ..	+ 8,000	− 3,000	− 10,000	− 5,000	+ 377,000	+ 2·00

Great Northern Railway (Ireland) receipts for the past week show an increase of £700, and Great Southern traffics are £4,336 up.

* * * *

British Railway Stockholders' Union

The report for the year ended October, 1936, which forms the fourth year in the history of the union, is an interesting and encouraging document. Membership of the union has shown further expansion, the net increase during the twelve months being approximately 4 per cent., and the widening interest attaching to the union's journal, *The Railowner*, has led to its being increased in size to 20 pages. The committee has decided to change, as from

the December issue, the title to *The Railway Stockholder*, which is more appropriate in view of the wider scope of the publication. Appreciative reference is made in the report to the action of Sir Josiah Stamp and Sir Robert Horne in addressing members of the union at luncheons organised by the committee, a policy likely to produce a still further increase in membership. Discussing the financial position of the four group companies, the report points out that their net revenue amounted to £32·92 millions in 1935 as against £44·98 millions in 1929, and the percentage of return on total capital receipts to 3·01 per cent. as compared with 4·17 per cent. in 1929. Standard revenue, as contemplated by the Railways Act, 1921, requires £51 millions, equivalent to 4·7 per cent. on total capital receipts. Present indications point to a total increase in gross receipts for the year 1936 approaching £5 millions.

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Overseas Railway Traffics

An all-round improvement in Argentine railway traffics is to be noted for the past fortnight. The Central Argentine leads with an increase of £49,169 in the two weeks, and the Buenos Ayres Great Southern has in the same period reduced its previous decrease by £24,619. On the Buenos Ayres & Pacific the improvement has been £10,409, on the Entre Rios £6,425, on the Cordoba Central £5,600, on the Argentine North Eastern £3,448, and on the Buenos Ayres Western £755. The British-owned companies operating in Brazil continue to show increases.

	No. of Week	Weekly Traffics	Inc. or Decrease	Aggregate Traffic	Inc. or Decrease
		£	£	£	£
Buenos Ayres & Pacific ..	22nd	78,706	+ 4,205	1,657,047	+ 36,794
Buenos Ayres Great Southern ..	22nd	128,354	+ 20,480	2,463,255	- 137,587
Buenos Ayres Western	22nd	51,294	+ 1,764	896,290	+ 20,464
Central Argentine	22nd	142,957	+ 27,919	3,020,974	+ 442,781
Canadian Pacific	47th	547,000	+ 6,000	24,551,200	+ 1,661,000
Bombay, Baroda & Central India	31th	207,225	- 34,875	5,122,500	+ 135,000

Gross earnings of the Canadian Pacific Railway for the ten months January—October, inclusive, show an increase of £1,590,800, and net earnings an increase of £118,800.

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Feeding the Multitude

Those who ascribe a lack of variety in restaurant car menus to an authoritarian imperviousness to criticism in the catering departments, will be relieved to hear that the uniformity is, on the contrary, in deference to the freely expressed will of the sovereign people. It is not lack of invention that causes *suprême de sole*, for instance, to figure so often on some railway routes, but the fact that "the North Country people seem to have a preference for it." We quote from an announcement recently circulated by the L.N.E.R., whose analysis of public taste should be representative in view of the fact that 2,741,000 meals have been served in the company's cars during the past year. In 1937 this total will undoubtedly be increased, for the present fleet of 224 restaurant cars and 51 buffet cars is to be augmented by 11 of the former, 15 of the latter, and two vehicles of special design combining features of both types. The ramifications of the L.N.E.R. are well known to be extensive, but perhaps this will be realised more vividly than ever when it is stated that the railway penetrates to districts so aloof from normal currents of taste that bacon and eggs is the most popular dish at all times of day.

* * * *

American Railway Safety

In none of their achievements do the railways of the U.S.A. take more pride than in their record of safety. As we recorded in our issue of January 24 last, no passenger was killed in an accident to a train on the American railways during the calendar year 1935, and now a complete analysis of returns enables this safety record to be considered in more detail. Actually one passenger did lose his life in a train, but this fatality, which occurred in November a year ago, was in no way connected with the movement of trains; it resulted from the explosion of a heater in a passenger coach while the train containing this coach was motionless. In 1935 the Class I railways alone carried a total of 446,000,000 revenue passengers with the non-movement loss of but one, while the toll of road deaths during the same period was estimated by the National Safety Council as 36,400, and so the claim of the U.S.A. railways to be the safest transportation agency seems to be well justified. Furthermore, this is no new feature, for, although last year's record is believed to have been achieved for the first time in American railway history, the previous years made very good showing. Of the 142 principal railways of the U.S.A., 130 had at the end of 1935 a clear record of no passenger fatalities in train accidents during the previous five years or more; 114 had such a record for ten years or more; and 99 for fifteen years or more.

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A New World's Record

In these days of ever-increasing speed, railway records are made only to be broken. The wide spaces of the North American Continent, with their prairie lands extending over hundreds of miles of the Middle West, offer an ideal field for long-distance record-breaking, and the diesel engine, capable of continuous high speed running over indefinite distances without the steam locomotive's susceptibility to the condition of its firebox and smokebox, is the ideal mode of propulsion for the purpose. Each of the new diesel-driven trains now being built by the competing railways between Chicago and the Pacific Coast appears on trial to go one better than its predecessors, and the Denver Zephyr of the Chicago Burlington & Quincy—the latter's reply to the Union Pacific's City of Denver—is the latest record-breaker. For the experimental run, four sleeping cars were cut out of the twelve-car stainless steel train, leaving eight coaches, which were occupied by 120 railway officials and Chicago business men. Over a shortened route of 1,017 miles, cutting out Omaha, the Denver Zephyr covered the entire distance without any intermediate stop in 12 hr. 12 min. 27 sec., and so averaged 83·3 m.p.h. throughout, including all slacks *en route*. It is claimed that for a short distance near the Colorado border a maximum speed of 116 m.p.h. was reached. Not only so, but the tentative schedule of 13 hr. which had been laid down for the trip was bettered by 47½ min. The best previous record for the same journey, of the original three-car Burlington Zephyr, was 13 hr. 5 min.

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Overcoming Winter Troubles

Winter brings its peculiar difficulties for the railways, and in some countries considerable sums have to be spent to keep the lines open. In Great Britain, generally speaking, the effects of winter are not specially severe, even in exceptional years, but are nevertheless sufficiently troublesome at times to cause no little delay, worry, and expense. Snowed up points and crossings, ice-coated live rails, frozen signal connections and fittings, frost-coated spectacle and other glasses, all contribute to interfere with the free and safe working of the trains, so that anything which will diminish their effects at reasonable cost must be welcome. In this issue we publish some particulars of a product, which has proved itself in the cold storage field, and the purpose of which is to defrost frozen objects and prevent the adherence of ice and sleet to vital parts of railway equipment. Some interesting trials which we witnessed make us feel that there should be a considerable

field for such a product, not only here but particularly in some Continental countries.

* * * *

The Boat Train Fire

Fires in trains are of very rare occurrence in this country—from 1909 to 1924 inclusive, for example, only two cases were enquired into—and it is unfortunate that the almost complete destruction of the vehicles concerned in the Southern Railway Channel Islands boat train fire of August 15, owing to lack of accessible water at Micheldever station, prevented Colonel Trench from coming to a positive conclusion as to the cause of the outbreak. His report will be found summarised on page 954. He was able to say that in all probability it was either a cinder lodging on a collapsible gangway covering, or a short circuit in the electric light wiring, the construction of which at least made this possible. Recommendations are made tending to improvement in this respect. The evidence was contradictory or hesitating on vital points—perhaps very naturally, as in the excitement caused by a fire persons easily form uncertain impressions and are not thinking of subsequent investigations—particularly as to which of two gangway doors the Pullman attendants opened when they were met by flames. Could this have been established Colonel Trench's task would have been much easier. However, the risk, small hitherto, will become still less when the present recommendations have been complied with.

* * * *

Braking and Line Occupation

The extension of high-speed passenger train services in this country is bringing to the fore as an important problem to be faced in the near future the question of improved braking. Such trains as the Silver Jubilee and the proposed six-hour trains between London and Glasgow and London and Edinburgh, fitted with the present standard brake equipment, have to be worked on the double-block system because of the long distance required in which to stop such trains from their highest speeds. In effect double-block working reduces the capacity of the track by requiring that it shall be clear ahead of the trains for a much longer overlap than usual. While the public demand for faster trains is directly responsible for forcing this subject to the front, indirectly the whole question of braking requires review because it is the existing slow goods trains without continuous brakes that at present occupy track sections for the longest periods. In this connection the recently completed equipment of continuous brakes on goods trains in France has resulted in a general speeding up of goods services. The heavy coal trains of the Nord, for example, weighing over 2,000 tons behind the tender cover the 130 odd miles between Paris and Lens in 5 hr. 40 min., an appreciable improvement on the average for heavy mineral trains in this country.

* * * *

Rolling Stock Finishes

The average railway passenger does not, as a rule, pay particular attention to the way in which the vehicles he travels in are finished, though he is appreciative of the greater comfort of the interiors now given him. So far as the exterior is concerned, he may notice a change in colour, but that, usually, is as far as his observation goes. He is not aware of the varied nature of the materials now available, and has no idea, probably, of the many advances that have been made in recent years. A summary of modern methods of decorative finishing of railway stock inside and out will doubtless be of interest to many of our readers, and the article by an authority on the subject, of which the first part appears on page 941 this week, should provide all the information that is required. Of particular interest are the author's remarks on vitreous enamelled sheets. Nearly 200 coaches in various parts of the world—India, New Zealand, Nigeria, and the Federated Malay States—are now finished with these sheets. English railways in general have not taken up the finish as yet, though showing themselves prepared to make trials of other materials. The author is evidently an advocate of spray painting wherever possible, both for exteriors and interiors, and most of the coach and wagon stock of the Egyptian State Railways, with which he is associated, is sprayed. In this direction the English railways, though following the practice in many cases, seem a little reluctant to go so far, though experience elsewhere has demonstrated that spraying is quite satisfactory, and is both quicker and cheaper than application by brush.

* * * *

Controlling Heat in Railway Carriages

In no part of the world are railway passengers unanimous upon the most desirable temperature for carriages, and in the less advanced communities differences of opinion or the urge to experiment are likely to have serious effects upon the heating equipment. Where open coaches are in use, moreover, it is hopeless to expect that a single regulating handle under the control of passengers can be adjusted to satisfy everybody. Special interest therefore attaches to a demonstration at the works of the Birmingham Railway Carriage & Wagon Co. Ltd. yesterday, attended by a number of railway officers and others, which showed the Vapor system of steam heating, manufactured in this country by Gresham & Craven Limited, as applied to coaches for the Chinese National Railways. In this system (described in THE RAILWAY GAZETTE of May 29 last, pages 1040-1041), steam at pressures ranging between 50 lb. per sq. in. as a maximum and 10 lb. as a minimum, is supplied in the usual manner to a main steam pipe line, suitably drained and arranged for standard vehicle intercoupling. From this point, however, the heat of the steam is controlled and distributed in a special manner, the steam supply, reduced to atmospheric pressure, being fed and controlled by easily accessible regulators *outside* the vehicle. Absolutely even heating is assured, and no high pressure steam is present in the coach at any point.

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The Child in the Train

It is frequently observable that travel by railway exercises a stimulating effect upon the juvenile mind, so much so that we have even heard a young passenger maintain a varied commentary upon the view to be seen from the windows of a tube train. Equally ambitious in his own sphere was the fledgling mathematician who threatened to count every telegraph pole between Exeter and Taunton, until a resourceful parent temporarily gagged him by the insertion between his scientific jaws of an outsize in lollipops. The slight dislocation which such feats inflict upon the mental processes (if any) of other passengers is generally regarded as an evil which must be endured because it cannot be cured; in Russia, however, we learn from a daily paper that it is proposed to provide special carriages for the segregation of mothers travelling with their families. In such vehicles, a junior comrade wishing to enrich the national culture by intoning the names of all stations between Moscow and Vladivostok, will be able to do so with a restricted range of interference. Whether such performers will find the same zest in their achievements in the absence of inoffensive adults to annoy or alarm, is, however, another matter.

XUM

Railway Freight Rebates

THE recent review by the Rates Tribunal of the operation of the Railway Freight Rebates Scheme during the twelve months ended September 30 last, and the publication of the Government Bill amending certain provisions of the Local Government Act, 1929, have largely removed the uncertainty following the establishment of the railway companies' claim that they have been materially over-assessed in respect of local rates since April, 1931. Briefly, the facts of the present situation are that under the Local Government Act, 1929, the railway companies were relieved from the payment of 75 per cent. of the local rates on freight transport hereditaments. The relief so afforded did not inure to the railway companies, however, but had to be paid into a Railway Freight Rebates Fund and used to assist trade and industry by the grant of rebates from the railway conveyance charges on certain selected traffics specified in the Act. The fund is administered statutorily by the Railway Clearing House, and the Rates Tribunal is charged with the duty of reviewing its operation annually before the end of November, and adjusting the level of the rebates in the light of the estimated rate relief for the twelve months ending in the following September. At previous reviews the companies have repeatedly informed the tribunal that, in their opinion, they have been considerably over-assessed for local rates and that their payments into the fund have therefore been excessive. The completion of their valuation by the Railway Assessment Authority for the first quinquennial period ended March 31, 1936, under the provisions of the Railways (Valuation for Rating) Act, 1930, and the subsequent legal proceedings and negotiations, have now confirmed the companies' contention and it has been agreed that there is about £9,762,000 to be repaid to the companies in respect of their overpayments to the fund between April 1, 1931, and December 31, 1936.

The repayment of this large sum to the companies would have involved the complete cessation of the freight rebates for a considerable time but, in order to avoid such an obviously undesirable step, discussions have been in progress for some months between the Government, the railways, and other interested parties. As a result, the Government has introduced a Bill into the House of Lords which seeks to amend in certain important respects the provisions of the Local Government Act, 1929, dealing with freight rebates. So far as the indebtedness to the companies is concerned, the Bill provides that the trustees of the fund, the Railway Clearing House, may, with the consent of the Minister of Transport, borrow on the security of the fund to meet its liability in respect of past over-payments, and also make payments out of the fund to repay the principal so borrowed. The Bill also provides that the principal and interest on the loan are to rank in priority to any other payments from the fund. At September 30 there was a credit balance in the fund of £1,066,990, which, however, will be slightly increased by the end of the year as the tribunal has agreed to the suggestion of the companies that, in the interest of traders generally, the existing scale of rebates should be continued to that date. The loan to be raised will therefore be about £8,600,000, repayable in sixteen years, and it is proposed to make the offer of stock as nearly as possible to December 15. Figures submitted to the Rates Tribunal showed that the companies have contributed a total of £28,725,188 to the fund during the seven years ended September 30, 1936, an average of just over £4,000,000 per annum, but for the twelve months to September 30 next they estimate the sum payable will be £2,330,000 only. This reduction in the quantum of the estimated rate relief would have necessitated a material reduction in the level of the rebates in any case, but the necessity of providing also for the sinking fund instalments required for the service and redemption of the loan of £8,600,000 will, it is estimated, reduce the amount available for rebates to something like £1,500,000.

Certain of the industries which have hitherto benefited from these rebates are now in a more satisfactory position than in 1929, and the Government Bill therefore provides that as from January 1, 1937, for a maximum period of sixteen years, rebates shall be granted only on exported coal, coke and patent fuel, milk and livestock, the rebates on raw materials for iron and steel works, feeding stuffs, &c., being discontinued. The Bill proposes also that of the amount available for distribution in the form of rebates, coal shall receive 80 per cent. and milk and livestock 20 per cent. It is expected that this restriction in the list of rebateable traffics will enable a rebate of about 5½d. a ton to be paid on export coal and coke, as compared with 8d. at present, and that the rebates for milk and livestock will be only slightly less than now. Thus, assuming the Bill is approved, the companies should receive a substantial proportion of the £9,762,000 in time for inclusion in their 1936 accounts. Apart from this sum, it will be appreciated that the companies are also entitled to the repayment of an appreciable proportion of the 25 per cent. of their local rates which they have paid to local authorities. The amount to be repaid under this head is in the neighbourhood of £3,000,000, and although there may be difficulty in meeting the claims of the companies in a few cases, many local authorities have been providing for this contingency for some time and will be in a position to repay the companies immediately their exact liability is determined. Meanwhile the companies will of course reap the advantage of the lower assessments in their current payments both to the fund and the local authorities.

* * * *

Japanese Government Railways Results

THE rapid increase in business experienced by the Japanese Government Railways between the fiscal years 1933-34 and 1934-35 was not continued at the same rate during the annual period ending March 31, 1936. Nevertheless, an increase under all heads was recorded, and the totals for gross receipts, passenger and goods traffic and revenue were higher than in any previous year, although the net receipts were still some 15,000,000 yen below the total for 1929-30. The operating receipts increased by 5 per cent. to 544,534,114 yen and the working expenditure by 4·9 per cent. to 329,537,000 yen, giving an operating ratio of 60·5, that is, practically the same as in the previous year. Interest and other financial charges amounted to 105,462,996 yen, and the net profit of 109,986,002 yen after meeting all financial commitments represented a return of 2·8 per cent. on the capital invested, viz., 3,938,262,736 yen. The number of passengers carried rose by 8 per cent. to 985 million, but the passenger receipts increased only by 6 per cent. as there was a drop in the average passenger journey from 24·7 to 24·5 km. and more passengers travelled with cheap tickets. The goods carried increased by 4·7 per cent. to 81·04 million metric tons, and the goods revenue by 4·5 per cent. to 225,343,248 yen. Although there are about 14,500 miles of railway in Japan new lines are being built constantly, and during the year under review the Government Railways opened a further 603 km., making the State-owned total 17,030 route km., corresponding to 27,299 track km. There was thus a slight

drop in the average revenue per km. of line open to traffic. The steam locomotive stock increased by 126 to 3,938 and the electric locomotive stock by eight to 173; three 500 b.h.p. diesel locomotives were put into traffic, and the total locomotive stock raised to 4,124. New electrified lines in the Kobe-Osaka district resulted in 47 electric motor-coaches being purchased, and the total now stands at 1,450. The coaching stock rose by 98 to a total of 9,514 and the goods stock by 2,455 (all air-braked) to 69,940. As usual, a profit was made on the shipping between the various islands, the takings amounting to 12,899,280 yen and the expenses to 6,743,420 yen. The working expenditure of the complete railway organisation was made up as follows (in percentages): general expenses 2·0; maintenance of way 17·3; electric traction 4·0; maintenance of rolling stock 9·7; transportation 26·0; traffic 33·2; road services 0·6; shipping 2·0; health and welfare 2·0; subsidies and relief associations 1·5; miscellaneous 1·7.

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Victorian Government Railways

FOR the year ended June 30, 1936, the operations of the Victorian Government Railways, Tramways, and Road Motor Public Services resulted in a deficit of £506,306, an improvement of £60,144 on the previous year. Revenue improved by £270,758, and there was a decrease of £23,856 in interest charges, but working expenses increased by £234,470. The net revenue of £2,843,503 from the joint undertakings represents a return of 3·65 per cent. on the total property investment, including stores and materials, as compared with 3·62 per cent. for the previous year. Railway net revenue was equivalent to 3·73 per cent. on railway loans, as against 3·68 per cent. in 1934-35. Part of the leeway in deferred maintenance and renewal work has been overtaken, and the position has otherwise been relieved by the large amount of relief funds made available by the Government for strengthening and improving the tracks. The Commissioners point out, however, that if the property is to be maintained in a satisfactory working condition, the amount provided for betterment and maintenance work during the next few years must be increased substantially. This applies particularly to the provision of up-to-date locomotives, carriages and wagons, and of modern plant at the Newport power house. The length of lines now closed, representing an approximate capital cost of £389,492, remains at 47 miles. Non-paying railways involved a loss of £172,097 during the year, of which sum the Treasury has relieved the railways to the extent of £163,859. Losses on other sections amounted to £167,587.

The substantial increase in railway revenue was derived mainly from country passenger business (£41,847) and goods and livestock business (£212,405). Faster and more frequent passenger train services were an important factor in improving country passenger revenue. In 1934-35 passenger revenue was increased by approximately £132,000 from extra traffic resulting from the centenary and other celebrations. In goods and livestock revenue the increase was mainly the result of the more favourable wheat season —wheat traffic receipts improved by £129,187, or 24·27 per cent.—and the general improvement in economic conditions. General merchandise tonnage increased by 8·41 per cent., but the revenue therefrom improved only by £42,069, or 3·18 per cent. Substantial concessions in rates had to be made to conserve traffic to the railways. The increase in total train mileage was partly due to the greater volume of goods traffic, and partly to the remodelled and improved passenger services. Further improvements were also effected in the regular goods train services upon certain lines. The length of line operated under the train control system is now 2,210½ miles, embracing nearly the whole of the important country main and branch lines. Some railway figures are given in the accompanying table.

	1935–36	1934–35
Average miles	4,721	4,721
Train-miles	16,390,943	15,536,111
Net earnings per train-mile	3s. 5·49d.	3s. 7·06d.
Passenger journeys	139,539,089	139,689,012
Goods tonnage	5,762,418	5,401,974
Operating ratio, per cent.	70·76	70·41
	£	£
Passenger revenue	3,713,411	3,685,978
Goods revenue	3,967,530	3,786,795
Total earnings	9,689,925	9,421,092
Working expenses	6,856,497	6,633,649
Net earnings	2,833,428	2,787,443
Capital expenditure	76,689,384	76,341,426

Substantial progress has been made with the construction at the Newport workshops of twelve Cor-ten steel vehicles for the Sydney Limited service. Noteworthy features include a semi-streamlined design, air-conditioning throughout, special springing, and automatic couplings. Entirely satisfactory results have been obtained with the two experimentally air-conditioned cars, one a standard country passenger car, and the other a steel dining car, which were placed in service in December, 1935, and February, 1936, respectively. It is proposed to extend the innovation to first and second class carriages on certain country lines, and fourteen additional equipments have been ordered. An order has been placed for five additional units for rail motor work, using "dieselene." During the year, and as a result of the grant of licences by the Transport Regulation Board, arrangements for co-ordination between the railways and the authorised road passenger services were made in a number of areas. The Government has decided to introduce legislation for transferring approximately £30,000,000 of railway loan liability to the State's General Account as from July 1 next.

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"Free to Free" Traffic in Ireland

THE article on the "Irish International Main Line" in our issue of November 6 was concerned chiefly with the trunk route of the Great Northern Railway (Ireland) between Dublin and Belfast which provides the main channel of communication between the capitals of the Irish Free State (*Saorstat Eireann*) and of Northern Ireland. The G.N.R., by reason of its geographical position as a border railway, is also the chief undertaking concerned in handling another traffic peculiarity that has arisen from the governmental division of Ireland, namely, what is called "Free to Free" traffic. This results from the fact that, although County Donegal is a part of the Irish Free State, its only land connection with the remainder of *Saorstat Eireann*, avoiding Northern Ireland territory, consists of a narrow strip in the south-western corner of the county connecting it with County Leitrim. There is no railway through this trip of territory, and therefore all rail traffic between County Donegal and other parts of the Irish Free State necessarily traverses a corner of Northern Ireland. The railways serving Donegal are the G.N.R.; the County Donegal Joint (G.N.R. and L.M.S.R.); the Strabane & Letterkenny (worked by the County Donegal Joint); and the Londonderry & Lough Swilly. The last-named is now mainly a road transport undertaking, so the G.N.R. and its associates are the chief interested parties.

This "Free to Free" traffic has been made the subject of special provision, and the railway companies ser-

XUM

ving County Donegal have made commendable and successful efforts to minimise the Border difficulty. To deal with this traffic the G.N.R. has provided nine 20-ton vans fitted for working on passenger trains, for the conveyance of traffic from Dublin to Donegal and in the reverse direction. To avoid Northern Ireland customs delays the procedure is simple and all that the consignor has to do is to fill up in triplicate a simple customs form (No. 63). Vehicles containing traffic for County Donegal, from say Dublin, on arrival at Dundalk (if routed via Portadown) or at Clones (if routed via Enniskillen) are sealed by the *Saorstat* customs officer, who retains one copy of form No. 63 and stamps and sends forward the other two copies. The vehicles then pass without examination through Northern Ireland until Strabane is reached, where the British customs officer breaks the seals and the contents are transferred under his supervision to County Donegal Railways Joint Committee or Londonderry & Lough Swilly narrow-gauge wagons. On completion of loading the narrow-gauge wagons are sealed by the British customs officer who signs and forwards a list of the contents of each vehicle certifying on the same that the transfer has been regularly carried out. This list is checked on arrival at the *Saorstat* customs station (Lifford or Castlefin) with forms No. 63, the seals are broken and if everything is in order the wagons pass through to destination. The same procedure is followed in the case of traffic passing from railway stations in County Donegal through Northern Ireland to railway stations in *Saorstat Eireann*, the vehicles being sealed by the British customs officials at Strabane and opened by the *Saorstat* officials at Clones or Dundalk.

For the due observance of the customs regulations governing the passing of sealed vans and wagons through Northern Ireland territory without customs examination, the Great Northern Railway Company (Ireland) with the other railway companies concerned (County Donegal Railways Joint Committee, Londonderry & Lough Swilly Railway Company, and Sligo, Leitrim & Northern Counties Railway Company) have jointly entered into bonds with the British customs authorities in amounts totalling £3,000. To facilitate the supervision by the British customs officer at Strabane and in order to avoid delay, a member of the G.N.R. Company's clerical staff at that station comes on duty at 7.0 a.m. and prepares (from the forms No. 63) lists of the goods in the sealed wagons. These lists are available for the British customs officer on his arrival on duty at 8.0 a.m. and all he has to do is to mark thereon the number of the wagon (County Donegal Railways Joint Committee or Londonderry & Lough Swilly) into which the goods are loaded. The *Saorstat* customs officer at Lifford having been furnished with these lists, makes a " spot check " of a number of consignments. We understand that the system works admirably; that the cases of delay do not total one per cent. of the number of consignments dealt with; and that when delay occurs the fault generally rests with the consignor in not supplying correct or full particulars. For these services the railway companies make no charge for customs clearance, and in addition, for a portion of the journey between Dublin and Strabane the goods receive a passenger train service at goods train rates. An example of the expeditious service afforded by these arrangements is provided by the fact that it is possible for traders to despatch goods by the company's 6.15 p.m. train from Dublin, and after traversing 180 miles (the goods having been examined and transhipped *en route*) to reach Donegal Town at noon on the following day. Similarly, in the reverse direction, goods despatched from Donegal at 1.0 p.m. arrive in Dublin at 11.30 on the following morning.

Air Resistance

ELSEWHERE in this issue we summarise a paper dealing with the air resistance of conventional and modified trains, the outcome of experiments initiated by the Advisory Committee for Scientific Research of the L.M.S.R., and financed jointly by that company, the L.N.E.R. and the Southern Railway. Mr. F. C. Johansen, Engineering Research Officer of the L.M.S.R. and author of the paper, has presented in readable form a truly impressive quantity of information gained almost wholly from wind tunnel experiments. Such experiments are open to many objections, all of which were duly pointed out in the course of the discussion, but there can be little doubt that intelligently conducted tests on models afford valuable information regarding the lines along which improvement might reasonably be sought. They are at any rate superior to the costly guesswork or cut-and-try again type of experiment on full size units. Sometimes, when a research worker, for comparative purposes, adjusts test figures obtained on models of different scales to make them applicable to the full scale, he is accused of fraud and deception. This, of course, happened to Mr. Johansen, for there always have been and always will be engineers whose sense of proportion leads them to think that one or two absolutely accurate figures obtained at stupendous cost are more valuable than a set of approximate computations, even though this set should cover a wide field, and suggest new lines of development. The most cogent objection to Mr. Johansen's methods related to his use of a flat stationary plate instead of a moving surface to represent the ground, but, as he explained in his reply to the discussion, the money allotted for the experiments would not permit of this refinement, much as he desired to be able to imitate in his models the relative motion between the train and the ground. It is indeed probable that some of his figures and deductions relating to the resistance of underframes would need modifying a little in the light of more elaborate experiments.

The main findings of Mr. Johansen's research accord well with what might be expected, and the paper contains few surprises. It makes out a case for modifying standard trains which are to run at high speeds, but it makes out a far stronger case for building special trains of nearly as possible ideal aerodynamic form, which, it may be stressed, would have to have a form of ventilation that did not require open windows. With such trains power and fuel could be saved, but in all probability the greatest financial return would accrue not from saving power but from utilising it to the full to secure higher speeds. A few railway engineers are still of the opinion that streamlining is without any but publicity value, but Mr. Johansen's paper demonstrates its desirability for the high speeds that are likely to be demanded in the near future. The experience of the L.N.E.R. lends support to this conclusion, and it was of practical interest, especially in view of the vertical V and rounded extremities of Mr. Johansen's ideal streamlined models, that Sir Nigel Gresley, who presided over the meeting, should mention his experience of the form of front fairing adopted on the L.N.E.R. streamlined engines. By engendering an upward current of air, this shape effectively lifts the exhaust clear of the driver's outlook even in cross winds, and another speaker pointed to the further advantage of this shape in tending to throw the air up from beneath the train, so reducing the resistance of the chassis which it is difficult to protect otherwise. Sir Nigel also mentioned that recent experiments had shown the possibility of savings amounting to about 12 and 35 h.p. at 100 m.p.h. if the rear of the train were cut back 12 and 18 ft. respectively to a similar beaver-tail shape.

LETTERS TO THE EDITOR

(The Editor is not responsible for the opinions of correspondents)

Engineering and Exporting

The Institute of Export,
11, Aldwych, London, W.C.2
November 25

To the Editor of The Railway Gazette

Sir,—In your issue of November 20 instant you have been kind enough to refer to the address given to our members by Mr. Rolt Hammond, in an attempt to illustrate the association between engineering and export.

You ask "is it the purpose of the Institute of Export to further this policy?"—that is to say the policy of demanding of every industrial country that its exports should exceed its imports. As I feel that this commentary may mislead your readers upon the true purpose of the institute, I shall be glad if you will allow me to point out that, while we take an intelligent interest in everything appertaining to export trade, we are primarily a professional organisation which exists to establish and raise the status of export executives; to ensure that they and others, either in or contemplating taking up export as a career, shall have facilities for acquiring the necessary qualifications; and also to try to inculcate into the minds of our manufacturers and the public at large, an appreciation of the importance of export.

I think I may say that enlightened opinion, in this country at least, is now recognising that imports and exports of both goods and services between countries must balance, that one must pay for the other. This institute regards exports as the means of paying for the country's imports, and from this aspect welcomes the import trade so long as other countries will accept the only means of payment open to us.

Yours faithfully,
R. J. TURNER,
Chairman

[We are glad to publish this disclaimer of support for the policy of forced exports.—Ed. *R.G.*]

Why Russia Adopted the 5-ft. Gauge

Bibliotaksgatan 11, Stockholm,
Sweden. November 2

To the Editor of The Railway Gazette

Sir,—The editorial note on page 600 of your issue of October 16 about the early days of the Russian railways sent me into my railway files for some material I knew I had on the part played in the early construction of this system by an American railroad builder, Major George Washington Whistler, father of the painter, James Abbott McNeil Whistler.

When Mr. Ralph Budd, President of the Chicago, Burlington & Quincy Railroad, was summoned to Russia in 1930 or '32 on a railroad commission for the Soviet Government, he was prowling in some official archives in Moscow and found a letter in Whistler's handwriting to Count Kleinmichel, the Tsar's somewhat incompetent advisor in railroad matters. This document concerned the question of a suitable gauge for the Russian railroads, and advised a rail-to-rail distance of 5 ft., as against our traditional width of 4 ft. 8½ in.

Mr. Budd had the letter photostatted and subsequently lent me the sheets, from which I made a typed transcript. That photostat is now in the collection of the James J. Hill Reference Library of St. Paul—which, I suppose, is where it belongs, as the library was given to the city by the great "Jim" Hill, himself a railroad man of some stature. (I went to "prep" school with his grand-children, and hence feel a special warmth toward the Hill tradition.) I am sending you my typed copy of the Whistler-Kleinmichel letter, as you may care to reproduce such an interesting document. Curiously enough, the scions of the Whistler clan settled in two spots in America, one group in the neighbourhood of Connecticut and the others in St. Paul, my own home town. Of the latter, one is Mr. W. R. Wood, Assistant Superintendent of Motive Power for the Great Northern Railway, Mr. Hill's "own" road.

Yours faithfully,

RODGER L. SIMONS

St. Petersburg, September 9th, 1842.

To His Excellency The Count Kleinmichel,
Aid de Camp General, etc., etc., etc.

As it is important that the question of width, or "gauge" of track, and the form and weight of the iron rails to be used on the St. Petersburg and Moscow Railroad should be determined as soon as possible, I beg leave to submit the following remarks and recommendations:—

The "gauge" of the track of almost all the railroads in Europe and America with some few exceptions is uniform, and 4 ft. 8½ in.—and however arbitrarily these particular dimensions may have been fixed upon originally, experience I believe has shown no sufficient cause for any material change—having been adopted on the earliest roads in England, its *precise* dimension continued from the necessary connections in the extension of the system, and I believe the question of altering it was not made until a very material increase in width was adopted in the construction of the Great Western Railroad in that country—since when it has frequently been the subject of investigation and discussion. All have agreed that the original 4 ft. 8½ in. is narrow enough; the question has therefore been confined entirely to an increase, and the advantage to be derived from this increase is generally stated to be an increased speed, beyond that heretofore acquired on roads of the ordinary gauge, and this to be attained,

1*st*.—By the mechanical advantage, or diminution of friction by increasing the diameter of the wheels, which may be done with wider gauge without raising the bodies of the carriages.

2*nd*.—Greater stability to the carriages on the track and consequent greater steadiness of motion, and

3*rd*.—Increased facilities for the adoption of large and more powerful engines necessary for the anticipated increased speed.

In relation to this anticipated increased speed, the experiments instituted to aid in the investigation of this question and reported upon by Mr. Nicholas Wood, an eminent English engineer, clearly show that any such extraordinary speed is acquired only by a very great sacrifice of power, and it seems to me there can be little doubt that the rapid increase of resistance with the increase of speed must lead to the conclusion that it is not advisable to attempt an extreme rate of speed, and in my opinion 30 to 35 miles an hour may be considered as the limit of practical speed for passenger trains, with due consideration to economy and a proper accommodation of the public—this rate of speed is attained on roads of the ordinary gauge with the same facility as on those of wider gauge—and it may be increased if thought advisable.

In reference to the mechanical advantage to be attained by increasing the diameter of the carriage wheels, it is true there will be a diminution of friction with the increase of the diameter of the wheels, but I have no reason to believe that raising the body of the carriage within the limits of a practical increase of the wheel would effect the result. While on the other hand, I do not think it would be advisable to increase the wheels beyond the ordinary practice for such a purpose, since the small advantage thus to be attained in the diminution of friction would be at the expense of heavier wheels and axles for equal strength, and in my opinion increase of speed had better be acquired if necessary by an expenditure of power as a greater means of security against accident; for large wheels cannot be made so strong as small ones.

In relation to the greater stability of the carriages on the wide gauge and consequent increased steadiness of motion, this is so dependent upon the construction of the carriages themselves, and the manner in which they may be connected together in the trains, that I cannot see what effect the gauge (within practical limits) can possibly have upon it—the experiments on this head, have not shown any advantages of the wide over the ordinary gauge.

In relation to the last mentioned advantage, viz., the facilities for adopting larger and more powerful engines, I can only say the result of my own experience, and the opinion of all the

builders with whom I have conversed, goes to show that an increased width of gauge is not necessary to this end—since engines may be, and have been constructed for roads of the ordinary gauge, of the maximum weight, and consequent power—due to the capacity (strength) of any rails now in use—and to increase the engine power beyond this would involve the necessity of an increase in the weight of the rail which I believe to be unnecessary in this case, as I have no doubt engines may be constructed for the ordinary gauge of sufficient power to draw the maximum, practically manageable train.

The objections to a material increase in the gauge beyond that in general use are:

1st.—That the necessary increased weight of the carriages consequent upon increased length of axles, which must also be increased in diameter to preserve equal strength, will only increase the cost, but the proportion of weight of cars to goods carried, which upon a road like this between St. Petersburg and Moscow intended as it is for the transportation of large quantities of goods should be avoided as much as possible.

2nd.—A material increase of gauge involves an increased cost in the formation of an increased width of road bed—the precise amount of which I am not at present prepared to say—but it is evident that in a line of such extent as this it must be very considerable.

These are the principal disadvantages of an increased gauge as immediately applicable to the St. Petersburg and Moscow Railroad, and I think it must be admitted that they are not met by any equivalent advantages. I would therefore recommend that 5 ft. be adopted as the width of "gauge" of the track.

I have adopted the additional 3½ in., because it is not necessary in this case to adhere to the precise dimension of 4 ft. 8½ in. for the purpose of connecting with other roads of that gauge, and because it is too small an increase to affect materially the important question of cost—and will be available for convenience in the construction of engines.

The form and weight of the iron rail: It will be unnecessary here to relate all that has been said on the various forms and weights of rails. The question has always been one of much importance, and early became the subject of scientific investigation, from which the general form for maximum strength has been deduced and confirmed by experience, being generally adopted with such modifications as the peculiar mode of fastening seemed to require—this form for maximum strength is that given to what is usually called the T rail.

In the arrangement of the exact form of the section of this rail, there are practical causes governing the distribution of the metal in addition to the more important one of maximum strength—one of these is, that whatever the general form or weight of the rail, the "head" or upper bearing part should have certain dimensions and weight with reference to the effect of the wheels moving over it aside from its duty as a part of the rail for supporting the weight. Another is the peculiar form to be given to the bottom web with reference to its steadiness in the chair or other mode that may be adopted for its fastenings.

In England and in Europe generally the rails are secured by means of cast iron chairs fastened to stone blocks or wooden sleepers at each bearing point, and for this purpose the bottom web is made not over 1½ to 2 in. wide and rests in the chair, secured by iron or wooden keys.

In America generally, the rails rest immediately on the stone block or wooden sleepers without the intervention of cast iron chairs—except at the end of each rail, where, the better to secure the relative position of the ends of the two rails, they are made to rest on a cast iron plate—the whole being secured to the sleepers by iron spikes. For this purpose the bottom web of each rail is extended in width sufficient to give a firm bearing on the sleeper without the aid of a chair, by which means the weight of the chair is applied to give strength to the rail. The result of my own experience and the opinion generally among engineers where this mode has been used has led me to the conclusion that this form of rail (called in America the H rail), and mode of fastening, gives at least equal, if not greater stability, greater simplicity, and economy than any other, I would therefore recommend that this form be adopted.

In relation to the weight of the rail, as this is a question of strength and has been the subject of direct experiment—it is dependent (within certain practical limits) upon the length of bearing, or distance between the supports, and the weight upon any one pair of wheels to pass over it—the practical limit for the distance between bearings is assumed to be between 3 and 5 ft. and the question then is between the economy of an increased weight of iron in the rails for a long bearing, or increased number of supports for the shorter—and I have decided, as the case is similar to America, that the wooden sleepers will be cheaper than the iron rails—and as the weight upon any one pair of wheels to pass over the rail need never exceed eight tons I would recommend, that the weight of the rail be established at sixty pounds to the yard—to be supported at intervals of every 3 ft.

Which is respectfully submitted by Your Excellency's Most Obt. Servt.

GEORGE W. WHISTLER

The Summer Timetables of 193?

London, November 30

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—In reading last Friday's issue of my old friend THE RAILWAY GAZETTE, may I say that I think the special article on "The Summer Timetables of 193?" is both clever and excellent. I was most interested in reading it and like it very much.

M. U. D.

PUBLICATIONS RECEIVED

Annual Overseas Railways Number of "The Railway Gazette." London, 1936: THE RAILWAY GAZETTE, 33, Tothill Street, S.W.1. Price 2s.—For the third year in succession this annual special number fulfils its useful purpose of acting as a compendium of railway experiences and ideas from the most widely separated parts of the world. The many practical articles—valuable not only as records of achievement in a period of rapid progress and enterprise, but as proved guides to fruitful lines of effort—are contributed by railway officers and others with first-hand knowledge of current operating and financial problems. The scope of the publication is wide, covering railways in the British Empire, British-owned systems elsewhere, and certain others.

Successive issues of this special number have recorded steady progress in the applications of new principles of working and maintenance, and in the present one this enterprising tendency is particularly noticeable. Railcars, lightweight and semi-streamlined trains, welding, and air-conditioning, are a few of the subjects of current interest to all railways regarding which important systems, working under the widest possible variety of conditions, relate their experiences.

There are fifty-two pages of articles in the issue, followed by sixty-eight pages of half-tone illustrations. A useful feature this year is the inclusion of footnotes to the articles stating the pages on which the relevant illustrations will be found, and there are corresponding cross-references to the text in the illustration pages. In general arrangement and size of page, this special number naturally conforms with the ordinary issues of THE RAILWAY GAZETTE.

P.O.-Midi Route Books.—Among a number of attractive holiday and travel booklets which we have received from the P.O.-Midi, French State, and Alsace-Lorraine Railways, are two P.O.-Midi route books, published respectively for passengers from Paris to Bordeaux, and to Toulouse. These are in English, and every page of letterpress faces a section of the route diagram, which as well as marking features of interest visible from the train, is made more interesting by excellent sketches of interesting features in the towns through which the railway passes. Reproductions of photographs appear throughout the letterpress. Descriptions are necessarily abridged in pocket booklets of this kind, but quite adequate to ensure an interesting journey.

Student Travel.—Winter sports enthusiasts who are qualified to avail themselves of the facilities provided by the National Union of Students will be interested in a booklet of Christmas tours published by the union at 3, Endsleigh Street, London, W.C.1. The charges are extremely moderate, and participants in the N.U.S. ski-ing tours enjoy the services of local student guides. Austria, Germany, Italy, and Switzerland are the countries in which there are student ski-ing centres. A five-day visit to Paris at Christmas is also advertised.

THE SCRAP HEAP

"Diligence Rewarded"

Mr. A. M. H. Solomon, who is probably well known—at any rate by name—to many readers both as a student of railway affairs and also as a motoring pioneer, has presented to the L.M.S.R. framed engravings of two large pictures entitled respectively "The Departure" and "The Return." The originals, painted by his uncle, the late Abraham Solomon, were exhibited at the Royal Academy in 1854, and then elicited Thackeray's well-known *bon mot*: "Here is Solomon in all his glory, but he is not arrayed (R.A.'d) like one of these."

Abraham Solomon was born in Bishopsgate, "within sound of Bow Bells," in 1823, and died at Biarritz in 1862. At the time these pictures were painted, he lived in Gower Street, London, and is believed to have visited Euston station of the old L.N.W.R. frequently in order to study and sketch railway scenes, so it may be assumed that the interiors shown in the engravings correctly represent the first and second class carriages of that period.

We understand that the original paintings are in the collection of Lord Lansdowne at Bowood. A smaller pair was shown a few years ago at the exhibition of nineteenth century woman's costume held at the house of the late Duchess of Fife. Other copies of the engravings are in the board room of the P.L.M. Railway in Paris, where they are highly prized.

Alongside we reproduce the two engravings that Mr. A. M. H. Solomon has now given to the L.M.S.R., from which it will be seen that they are of the "subject picture" type familiar in mid-Victorian days, about which one was expected to conjure up a story with a moral. The engravings were published in London on April 4, 1857, by F. Gambart & Company of 25, Berners Street, and bore only the brief captions "The Departure (Second Class)" and "The Return (First Class)," but, when the original oil paintings were at the Royal Academy in 1854, they were described more fully as "Second Class: The Parting. Thus part we rich in sorrow, parting poor," and "First Class: The Meeting. And at first meeting loved."

At that time *The Athenæum* outlined the story which is generally accepted as that which inspired the painter, and of which we append a prècis. "The Departure" may be taken as portraying a youth in poor circumstances, with his recently-widowed mother who is taking him to join a ship. A tearful sister watches his manful struggles to appear unconcerned, and an old sailor in the next compartment regards the scene with sympathy.

Imagination is required to supply the link between the two pictures, during which period the orphan, by diligence and ability achieves the rank of an officer—surely, in the best Victorian tradition, these qualities must have been possessed in no mean order for the transition to have been made. We are thus led up to the second scene, where the successful youth—now fairly affluent—comes home on leave to visit his mother and travels first class. In the compartment he gets into conversation with a fellow traveller and his pretty daughter, and tells them of his experiences. The original caption confirms the expression on the lady's face that the young couple "at first meeting loved," and doubtless Victorian romanticism would have demanded that they eventually married and lived happily ever after.

THE DEPARTURE: SECOND CLASS
("Thus part we rich in sorrow, parting poor")

THE RETURN: FIRST CLASS
("And at first meeting loved")

Reproductions of two engravings of paintings by the late Abraham Solomon which were exhibited at the Royal Academy in 1854. Copies of the engravings, which represent scenes in old L.N.W.R. carriages, have been presented to the L.M.S.R.

OVERSEAS RAILWAY AFFAIRS

(From our special correspondents)

NEW ZEALAND

North Island Deviation

At an estimated cost of £500,000 the construction work of the Turakina-Fordell-Okoia deviation of the Wellington to New Plymouth main line has been put in hand. The line is not expected to be finished until 1939.

Bigger Locomotives for the Midland Section

To meet the increasing tonnage of traffic the Railway Department has undertaken a programme of improving the transport facilities on the Midland line between Canterbury and the West Coast. A number of heavier and more powerful locomotives than those at present in use will be put into commission, and, as a preliminary to their introduction, bridges between Christchurch and Arthur's Pass (87 miles) will be strengthened considerably. The programme also includes the replacement of the present 55 ft. turntable at Springfield (44 miles) with a triangle, and the present 55 ft. turntable at Arthur's Pass with a 70 ft. turntable. These alterations are necessary on account of the increased length of the heavier type of locomotive that will be used. The more powerful locomotives will enable considerably increased tonnages to be hauled by a single engine between Arthur's Pass and Christchurch, where the loading is particularly heavy, and has been increasing during recent years.

ARGENTINA

Salta-Socompa Railway to be Replaced by a Road

A technical committee of the National Roads Board recently visited the Province of Salta, to study a scheme for connecting San Antonio de los Cobres with Socompa, in Chile, by a road instead of the abortive Salta—Socompa international railway. Although no official pronouncement on the subject has yet been made, it is believed that the Government would favour the substitution of a road for the railway, in view of the economy to the national finances. It is estimated that the cost of constructing a road would be only about a million pesos, as compared with the 40 millions voted by Congress for the completion of the railway. The distance from Salta to Socompa is 320 miles, of which the 122 miles to San Antonio de los Cobres have been finished. Presumably, it is over the remaining 198 miles to Socompa that it is now proposed to construct a road.

It may be pointed out that the Salta-Socompa Railway was intended to be complementary to a similar line in Chile, 84 miles long, from Socompa to Augusta Victoria, where it would join up with the Antofagasta (Chili) & Bolivia Railway, the gauge of which was altered from 2 ft. 6 in. to 1 m., in order to conform to that of the new line. The Chilean section from Augusta Victoria is already partly constructed, although progress has been very slow, but if it is decided finally to abandon the Argentine line in favour of a road, the Chilean project will also have to be dropped, as the one section would be entirely useless without the other.

New Buenos Aires Subway

Work has been begun on the Plaza Mayo—Plaza Italia—Palermo section of the new Buenos Aires underground line to the suburb of Belgrano. The concessionaire for the scheme is the Compañia Hispano — Argentina de Obras Públicas y Finanzes which constructed the line from Plaza Constitución to Retiro that was completed and opened to service in February last. The same company has also obtained the concession for two other projected subways to Parque Chacabuco and Caballito Norte. The method of constructing the new line differs from that employed on the earlier Buenos Aires subways, as the boring of the tunnel is being carried out from both ends simultaneously, so as to expedite the work.

The Plaza Mayo subway will run underneath the Diagonal Roque Saenz Peña, and Calles Córdoba and Santa Fé at a depth of 10 m. There will be 11 stations, at Plaza Mayo, Calles Carlos Pelligrini, Lavalle, Callao, near the Faculty of Medicine, Calles Pueyrredón, Agüro, Bulnes, Canning, Plaza Italia, and Palermo station (B.A. & Pacific Railway). The distance between Plaza Mayo and Palermo is 6½ km., which is expected to be covered by the trains in 10 minutes, as compared with more than double that time by surface vehicles. The cost of this section is estimated at $37,000,000 paper. It is expected that the line will be finished and opened to service by the end of 1937.

Expropriation Lawsuit Entre Rios Railways

The Entre Rios Railways Company recently sued the National Government for the sum of $5,000,000 paper as compensation for the expropriation in 1929 of the Hasenkamp—Crespo branch of the system. The Government legal representatives urged that the price should be based on the recognised capital, or say, $2,952,003 paper, plus 20 per cent. indemnity, in accordance with the Mitre Law, No. 5315. The company's claim was rejected in the first instance, and was then taken to the Federal Court, which annulled the finding of the lower court. At the second hearing, the Federal Court ruled that the invoking by the Government of the Mitre Law was inadmissible in the present case, inasmuch as the concession for the line was granted prior to the passing of the law referred to, which clearly established that its provisions applied only to concessions granted after its enactment. After considering all the circumstances, the court assessed the value of the line on the basis of the earnings during the last financial period prior to expropriation, which were $448,158 paper, capitalised at 8 per cent., giving a valuation of $5,601,975 paper. On the Government appealing, this amount was reduced to $3,500,000 paper, which the court ruled was the sum actually owing to the railway in respect to the expropriation of the line, less $2,952,003 already paid, plus interest and costs.

INDIA

Rates Information Bureau

As mentioned in these columns previously, there was a proposal some three months ago to open a Rates Information Bureau at Cawnpore for the purpose of furnishing correct railway rates to local merchants and traders. It is now announced that under the auspices of the East Indian, Great Indian Peninsula, Bombay, Baroda and Central India, and Bengal & North Western Railways, this bureau will be opened at Cawnpore on December 1, and it will there be possible for merchants to obtain reliable and up-to-date information about the current rates for goods traffic. It is considered that the experimental office will be of great assistance to business men, who have now to write to the administrative offices of the railways concerned for correct rates, a procedure involving much delay and some inconvenience. The new bureau will be staffed with selected men, who will be in a position to give the most accurate and the fullest information about current goods rates. The selection of Cawnpore for this experimental bureau is justified by its outstanding importance both as a commercial centre and as a railway junction. The railways concerned hope that full use will be made of this new facility, for upon its success will depend largely the decision whether it will be practicable to establish similar offices elsewhere.

New Type of B.B. & C.I.R. Coach

The B.B. & C.I.R. workshops at Parel have now turned out a new type of heat-resisting passenger coach. Against the ordinary ceiling is pressed a second layer of board specially treated to resist heat. Between this layer and a third layer of heat-resisting material, is a small air gap which further helps to make the interior of the coach less susceptible to the outside atmospheric temperature. The flooring of both

upper and lower class compartments is of concrete in place of the tiles in the old design. Concrete floors are cool and easily washable and the absence of crevices prevents the collection of dust and thus generally promotes sanitation. The seats in the third class compartments are transversely arranged, with an overhead light and door for each set of seats. Sleeping bunks are provided, as in the old type. There is also a small compartment with seating accommodation for 12 persons, suitable for family parties. The small compartment is connected with the general third class compartment by a door.

In the new type of coach the partition wall between the upper class compartments, which is of thick wood in the older designs, is made of a new light substance of the nature of compressed paper and has an outer covering of Rexine. Rexine also replaces leather in the upholstery of the seats. The springing of the seats and bunks has been considerably improved. The use of little padding and more springs makes for increased riding comfort. By using a special enamel, the final coating of varnish has been eliminated. The new design is, therefore, more economical in construction and also lighter in weight, and specimens of it are now undergoing comparative trials with old coaches. Each coach, old or new, under test is fitted with a battery of thermometers, and the different types are placed side by side, temperature variations being carefully watched and compared.

FRANCE

Financing of Railways

In view of the growing deficit of the French railways, the Government proposes in its new budget that the railways in future must undertake their own financing, and must raise loans in the market on their own responsibility; the Government will limit its liability in regard to the payment of interest charges resulting from such borrowing. This may involve a revision of the Convention of 1921, under which a common fund pooled the profits or deficits of the railways. The Government has decided that the State cannot continue indefinitely to meet the heavy deficit due to the current unprofitable operation of the railways.

From 1921 to 1926 the railway deficit accumulated until it exceeded fr. 5,000 million (approximately £48,000,000), and since that time the unprofitable years have increased the total until on December 31, 1936, it will exceed fr. 28,000 million (£270,000,000). The annual interest charge on the railway debt now amounts to nearly fr. 1,800 million (£17,000,000), and is increasing by about fr. 450 million (£4,300,000) yearly.

Another measure planned by the Government is a tax of 50 per cent. on the railway companies' reserves. This levy is to be imposed on the ground that the companies cannot be allowed to continue to set aside part of the operating receipts for the benefit of their shareholders unless they make some compensatory contribution to the State.

Further Traffic Improvement

French railway traffic continues to improve, however, and the latest returns of wagon loadings show a sharp rise of 19·51 per cent. for the 44th week in comparison with the same week last year. In the three preceding weeks the increases were 2·50, 3·14 and 6·59 per cent. successively. Both passenger and goods traffic receipts are increasing. In the 43rd week, the total receipts rose by 4·67 per cent. in comparison with last year. All the railway systems showed gains, except the Nord, and its deficit was only 0.34 per cent.

Conference of Tourist Agencies

The annual conference of world tourist agencies organised by the French railways was held recently at the Hotel Continental in Paris. More than 200 delegates were present, and M. Octave Pierre, delegate for the Paris Exhibition, explained the travel facilities to attract tourists to the exhibition. The railways will allow a reduction of 50 per cent. in fares on the French lines to and from Paris. To benefit by this and other advantages, the tourist must obtain a special card, known as the "carte de légitimation," sold at fr. 20 and valid for six months on condition that the tourist stays in Paris at least five days. During the six months he may travel anywhere in France with a reduction of 50 per cent. The card also gives the right to ten half-price exhibition entry tickets and to reductions for theatres, cinemas and other shows. French shipping and air companies will also offer cheap fares.

GERMANY

Central European Railway Association

A new handbook is to be issued to commemorate the 90th year of the Central European Railway Association (*Verein Mitteleuropäischer Eisenbahnverwaltungen*) formerly known as the German Railway Association. Its history was dealt with in an editorial article in THE RAILWAY GAZETTE of June 16, 1933. Founded in November, 1846, at the initiative of 10 Prussian railway managements, it now includes 112 administrations covering about 94,300 km. (58,595 miles) of line, including the State Railways of Germany, Austria, Hungary, the Netherlands, Sweden, Denmark, Norway, Switzerland, and the Luxembourg Prince Henry line. In addition the Czechoslovak, Polish, Jugoslav and Greek State Railways are associated with the *Verein*, and the German Lufthansa and Mitropa concerns. The work of the association is carried on by a number of committees and issues both a general (weekly) and technical (monthly) journal which occupy prominent places in railway publishing activities.

DENMARK

Locomotives and Rolling Stock

Higher speeds on the State Railways are now urgently calling for quicker-acting brakes, and the intention is, therefore, to convert all engines and rolling stock from vacuum to air brake equipment. The cost is estimated at from kr. 10 to 12 million. The goods stock will first be air-braked and afterwards the locomotives and coaching stock. Coaches now running into Sweden or Germany are already dual fitted, but goods wagons are mostly fitted with hand brakes only.

The policy of replacing steam locomotives by electric motor coaches and diesel units is being continued; during the past two years the former have been reduced by 32, and 38 of the two latter have been added, states the Department of Overseas Trade Report on Economic Commercial Conditions in Denmark, August, 1936.

SWEDEN

New Financial Arrangements

The Swedish State Railways have asked for the sum of 11,285,000 Kr. out of the budget year 1937-38 for new works, equipment and rolling stock. A sum of 3,800,000 Kr. is to be spent on bringing the permanent way up to a standard on the electrified sections, for 100 km.p.h. (62·14 m.p.h.), the work to be finished in 5 years. The annual cost of these and other improvements will be 6,400,000 Kr., of which, however, nearly half will be covered from the renewals fund. A further 2,800,000 Kr. are to be spent on 26 new passenger coaches, 1 restaurant car and 15 goods vehicles; a similar sum will be forthcoming from the renewals fund. Wooden coaches are no longer to run in international trains, and so 15 will have to be replaced by all-steel ones. Of the 4 millions granted for road motor services, 41,000 Kr. remain. The railways are asking for a further 2 millions, chiefly to enable them to take over some bus lines. The present electrification programme will be completed by the end of 1937 and will effect a yearly saving of about 3,220,000 Kr.; of this 2,800,000 will be used for 13 additional electric locomotives and 3 transformer groups, which have been found necessary.

SWITZERLAND

Federal Railways Budget Approved

The Federal Council approved on November 13 the report accompanying the budget of the Federal Railways for 1937 (details of which were given in the November 13 issue of THE RAILWAY GAZETTE), and will recommend that it should be accepted by the Federal Assembly. It is expected that re-

ceipts will be appreciably higher than estimated in the budget, in view of the alignment of the Swiss franc and the improvements in trade and tourist traffic which should result.

Brighter Prospects

The October results already show some increase, and considerable winter sports movements are anticipated for the coming season. The higher purchasing power of the pound and dollar in Switzerland, continuance of the 30 per cent. reduction on rail fares for foreign visitors, and attractive inclusive rates quoted by the various travel organisations, should help to produce a marked increase in the tourist figures for 1937, with consequent favourable effects on the receipts of the Federal and private railways.

Reorganisation and Road Traffic Control

The draft of a Bill for the reorganisation of the Federal Railways is at present being examined by the Federal Council, but it is not likely to come before Parliament until next year. Its main purpose is to place the system on a sound financial basis, and to take steps to prevent a fresh accumulation of deficit, but a difficult aspect is also that of staff wages and pensions, regarding which there are serious differences of opinion. The first draft of the Bill was submitted in June, 1934, but numerous revisions were found necessary and a fresh draft was published in March last.

Another Bill affecting the future of the railways, which is expected to be discussed during the December session, provides for a more equal division of traffic by subjecting road transport to a system of licences; these would be granted only where the necessity for the proposed services could be proved, and only for transport within a radius of 25 km. from the home garage, all traffic over greater distances to be conveyed by rail. This represents a fresh attempt to solve the "road-rail problem," the first scheme having been rejected by the Swiss people in May, 1935.

CHINA

Shensi-Szechwan Railway

The route selected by aerial survey for the proposed line to connect Chengtu with the Lung Hai Railway, begins at Paoki, a point on the western extension of the Lung Hai main line west of Sian, and strikes southwestwards through the Tiensha Pass to Liangtang, and thence via Hwei (Huih), Cheng, Pikow, Kwangyuan, Kienchow, Tzetung, Mienchow and Lokiang to Chengtu. The total distance from Paoki to Chengtu is said to be about 700 km., of which the northern 150 km. appear to be in very difficult country, the next 200 km. in moderately hilly terrain, and the remainder in comparatively open plain or low hills.

The Taokow branch of the Peiping Hankow Railway is to be extended to Neihwang in the near future, and to Taming next year.

Accident Due to Badly-Sited Signals

A report has been issued concerning the accident at Liuchueng on October 1 when the north-bound Pukow—Peiping through train No. 306 came into collision with a coal train about 1.0 o'clock a.m. Damage estimated at about $30,000 was done to rolling stock and two firemen were killed, a policeman and a car attendant, seriously injured, and twelve car attendants were slightly injured; nine passengers were also slightly hurt.

The cause of the accident is attributed to the difficulty in obtaining a clear view of the signals from the locomotive and this is said to be due to the topography of the district in the Ur Long Valley where the grade is heavy and the track takes a winding course. Trees and buildings also obstruct the view and the drivers have considerable difficulty on this account. Ordinarily it might be contended that the drivers should not proceed when they have not a clear view of the signals and that they should treat such obscurity as a danger signal, but local conditions have sometimes to be taken into account in passing judgment, and it is not always the fault of the drivers. Signals are not always placed in the most advantageous positions and the question of sighting from the footplate does not always receive sufficient attention. In such cases the drivers have to make the best of it.

SOUTH AFRICA

Improvements in Cape Colony

The Cape Western line, from Worcester to Mossel Bay, is being realigned and modernised. Entirely new stations are being built at Riverdale, Swellendam, Heidelberg, and Albertinia.

Train Service Accelerations

With effect from December 3, train services between Johannesburg and the Cape will be further accelerated. The times of the Union Limited and Union Express will be reduced by 1¾ hr. The journey to Capetown will occupy 25¾ hr. at an average speed slightly in excess of 37 m.p.h.

Financial Position

The results of working for the six months April to September show a revenue surplus of £607,591 over expenditure, after allowing for special appropriations of £425,000 to Betterment Funds, £243,500 to deficiency in Pension and Superannuation Funds, £500,000 to Rates Equalisation Fund, £125,000 to reduction of Branch Line Capital, £625,000 to Renewals Fund, £835,004 to Responsibility Allowance and refund of the 1932-33 temporary wage deduction, £125,000 to writing out of Capital Account discount and expenses on pre-Union capital and £16,492 to writing down value of obsolete aircraft.

Revenue from transportation services only for the period totalled £15,664,237, an increase of £1,304,821 on the previous year. Working expenses increased from £9,583,989 to £10,050,951.

Petrol Rate Reduction

It is expected that in the near future there will be a substantial reduction in the rate on petrol. For some time past the Minister of Railways, Mr. O. Pirow, has been negotiating with the petrol companies with the object of bringing down the price of petrol to inland consumers by sixpence a gallon, made up of a concession in railway rates of 3d. a gallon, and a further concession of 1d. each by the oil companies, the retailers and the Treasury.

SPAIN

Conditions at Valencia & Madrid

The Norte station at Valencia is at present a hive of activity and everything seems to be in a state of great confusion. The platforms swarm with children evacuated from the Madrid area, soldiers proceeding to the war zones, elderly peasants, crying babies, baggage, bundles, live chickens in crates, and bewildered railway employees. It is doubtful if one train a week arrives on time, and the congestion is so great that most of them are from 1 to 5 hr. late. Despite the fact that every vehicle has been pressed into service, trains are very overcrowded, and there is insufficient locomotive power to deal with the additional loads. The train from Barcelona one morning was double-headed and consisted of eleven carriages, all of different types, ranging from an old wooden third class coach to a brand new Wagons-Lits sleeper, with five goods wagons attached in rear. On the next track stood a solitary old, wooden, four-wheeled, third class carriage filled with soldiers, that had apparently stood there for several hours waiting to be attached to some troop train. On another track three vehicles bearing propaganda paintings were filled with children. The majority of the trains are specials; about three troop trains leave daily for Madrid.

Whilst it has been announced that the track is again clear to Madrid, the threat of aerial bombing seems to have deterred the authorities from restoring a through service. Passenger trains proceed to Alcazar de San Juan, some 125 km. from the capital, where passengers are transferred to motorbuses. The general public shows a certain reluctance at using the up service, but the return trains are so popular, and have latterly been so overcrowded that the Madrid authorities were obliged to intervene, and have now made it very difficult for anyone to get a permit to leave the city. Goods trains go as far as Aranjuez, 45 km. from Madrid, and the contents are taken onwards to the capital in lorries.

WELDING PRACTICE FOR RAILWAY ENGINEERS

Latest developments in Great Britain and abroad

By Dipl.-Ing. O. BONDY, M.I.Struct.E.

WELDING has been applied to railway purposes in England on an ever-increasing scale during the past two or three years, after many years of pioneering work. The caution exercised during the period of development was rewarded by the avoidance of many mistakes and failures which might otherwise have been experienced. It is a fact—not sufficiently recognised—that England was leading in the practical application of arc welding at a time when experimental work had hardly been begun abroad. This was so not only in the application of welding to shipbuilding (the welded motorship *Fullagar* was built in 1921), but also in structural work. As early as 1920 and 1921, steel-framed buildings of quite considerable dimensions were erected in London and at Stoke-on-Trent by arc welding using butt joints.* In the railway field, the strengthening of bridges by electric welding was raised to a high level of perfection by the pioneering activities of the London & North Eastern Railway.

The following paragraphs relate to some of the latest developments in welding both in England and abroad, especially in Germany.

Goods Wagons, Passenger Coaches, Locomotives

Much has been accomplished by the railway companies of Great Britain in these fields. Thus, in 1935, twenty-six first class sleeping cars for the L.M.S.R. were built by welding in that company's Wolverton works, since when welding for the construction of underframes, bogies, and outside body sheeting is being adopted as standard L.M.S. practice. Underframes for the L.N.E.R. Silver Jubilee train and other rolling stock are of all-welded construction. The London Passenger Transport Board has acquired welded wagons 68 ft. in length for the carriage of 61 ft. rails. Locomotive boilers, cylinders, frames, and many other components are now welded, and, in particular, valuable savings of weight have been effected by welding the bogie frames of passenger coaches. The welding department of the L.M.S.R. workshops at Derby has been enlarged year by year.

The trend of development in Germany is best shown by the following figures. Out of 12 types of goods wagons, seven have been built by welding, four of them both in ordinary mild steel (St 37) and also in high-tensile structural steel (St 52). Up to the present, about 1,640 large-capacity covered goods wagons, 500 open goods wagons and 227 eight-wheeled rail-carrying wagons have been built by welding.† The saving of weight by welding amounts to from 8 to 13 per cent. using St 37 mild steel, and from 18 to 23 per cent. using St 52 high-tensile structural steel, these figures applying to the carcass as delivered by the wagon builders, without the parts added by the German State Railway Company. In the case of high-capacity goods wagons, for a useful load of 60 metric tons (59 tons 1 cwt.), welded construction reduces the deadweight from 21·2 metric tons (20 tons 17 cwt.) to 18·4 metric tons (18 tons 2 cwt.), or by 13 per cent. Forty-five wagons of this type were built by welding in 1934. From time to time, the constructional rules have been improved by the application of practical conclusions based on the examination of incipient failures in the welded joints of vehicles subjected to full-scale collision tests.

The rapid adoption of welding in passenger coaches is the more remarkable in view of the fact that the first steel coaches in Germany were placed in service only in 1912. The first welded corridor coach was built in 1931, but by 1934 about 300 passenger coaches had already been built for the German State Railway by welding, and since 1935 all the company's new coaching stock has been of welded construction.* The substitution of welding for riveting in so short a period is a clear indication of the satisfactory results obtained. The weight of riveted corridor coaches, first, second and third class, was 47 metric tons (46 tons 5 cwt.) compared with 39 metric tons (38 tons 8 cwt.) for the welded construction, a saving of 17 per cent. by welding. The saving on the weight of bogie frames with brake equipment amounted to 31·2 per cent. The tare weight of the so-called ultra-light eight-wheeled trailers for diesel railcars has been reduced from 18 metric tons (17 tons 14 cwt.) to 13·4 metric tons (13 tons 4 cwt.), or about 150 kg. (331 lb.) per seat, with seating accommodation for 90 passengers. In attaining this result, the weight of the coach body has been reduced by 40 per cent. and the weight of the bogies by 36 per cent., partly by the use of welding and the special features of design thus made possible, and partly by the extensive use of high-grade structural steel (St 52) with a minimum tensile strength of 52 kg. per sq. mm. (about 33 tons per sq. in.).

Hollow box-type girders have been much used in these welded constructions, but the risk of internal rusting should not be overlooked. Recently, overlapping rounded-corner plates have been adopted in bogies in preference to butt-welded connections which, in this application, are apt to develop fatigue cracks. In coach frames and bodies the risk of fatigue failure is much reduced, these parts being sprung.

Spot welding has been applied extensively to the roofing plates and outer side plates of coach bodies, and welding machines with specially long reach have been developed for this purpose. On the other hand, there has been some reversion to riveting in the connection of thin roofing plates, the weight of the rivet heads being no greater than that of the welded seams, and distortion of the thin sheets being more easily avoided by riveting.

Welding is also freely used in the building of locomotives not only for the heavy main frames but also in the body and boiler. All-welded copper fireboxes, subjected to X-ray examination before use, have given complete satisfaction in service. As regards electric locomotives and diesel railcars, the above remarks on welded coaches again apply. All these welded vehicles have shown, during years of service, that good welded connections are not liable to fatigue failure, provided always that the design and execution are structurally correct.

Permanent Way Welding

During recent years all the principal methods of welding have been applied successfully in the permanent way field, and it has become common practice to form continuously

* *Engineering*, May 14, 1920, and March 18, 1921.

† Schinke, *Organ für die Fortschritte des Eisenbahnwesens* (Berlin), June 15, 1936.

* F. Boden, *Organ für die Fortschritte des Eisenbahnwesens* (Berlin), June 15, 1936.

welded sections of track by joining a number of standard rail lengths. Favourable experience has been obtained with Thermit welding which has been adopted on a larger scale than any other type of welding for joining rails end to end. Gas welding has been used to some extent also for the same purpose, but has been used more widely for the building up of worn crossings, although electric arc welding is still the standard method for reconditioning permanent way fittings in Great Britain. The electric resistance method has made remarkable headway in the end-to-end welding of rails, the method being used in Australia, Belgium, Germany, Latvia, Netherlands, East Indies, Sweden, the U.S.A., and elsewhere. A 160/320 kVA. resistance welding machine capable of carrying an overload of 320 kVA. for 5 min., has been in use on the Austrian Federal Railways since July, 1935, and the considerable capital outlay involved was recovered during the first 14 months' operation by the saving on fittings and accessories for rail joints, quite apart from substantial indirect savings on the maintenance costs of permanent way and vehicles. The usual practice in Austria is to cut 0·5 metres (1 ft. 7½ in.) from each end of old rails and weld the remaining lengths to form continuous sections up to 56 metres (183 ft. 9 in.) in length. In this way, the life of the rails seems to be prolonged considerably. For the building up of worn crossings and other permanent way fittings, as well as for rail bonding, welding, both electric arc and gas, has been used extensively.

Regulations for Welding and Testing

In the United Kingdom, the British Standards Institution has already issued a number of standard specifications providing official guidance on bare wire and covered electrodes, the welding of steel structures, the rating of welding plant, protective glasses, and other matters. In Germany, rules were issued in August, 1935, for the testing of welded joints by X-rays and gamma-rays, these rules being particularly important in the application of welding to railway purposes. Practically all welds in vehicles for the German State Railway and in railway bridges are subjected to examination by X-rays, the technique of which has made such progress that the method is now the most important of the non-destructive means of testing. There have been developments, not only in the methods and equipment for taking X-ray photographs, but also in the precision of distinguishing and interpreting the records obtained, and it seems probable that—notwithstanding the considerable initial outlay required—examination by X-rays will become the standard method of testing welds in railway practice, at least for the vital components of locomotives, vehicles and bridges.

The Preliminary Rules for Welded Plate-Girder Railway Bridges, issued in Germany in November, 1935, contain many new and noteworthy provisions. It is, for instance, prescribed that the contractor must have at his disposal X-ray or other approved testing equipment, and suitable rotary holding devices permitting large bridge-components to be welded in the most favourable position. The permissible working stresses in butt welds have been considerably increased in some respects by the new German rules, as shown by the accompanying table, which includes, for comparison, the stresses permissible in a number of other countries. Apart from their direct influence on design and their importance as the basis of static calculations, the permissible working stresses afford a measure of the confidence reposed in welded joints, and there could be no more cogent testimonial to welding than the fact that the stresses permitted in welded connections have been raised by almost every industrial country during recent years.

Permissible Working Stresses in Butt Welds

Country	Year	Permissible Working Stress in V- and X-Butt Welds					
		Per cent. of Parent Metal			Tons per Sq. In.		
		Tension	Compression	Shear	Tension	Compression	Shear
Great Britain ..	1934	85	100	85	—	—	—
Australia ..	1933	—	—	—	7·0	7·0	5·6
Germany ..	1934	75	85	65	—	—	—
,, Bridges	1935	80	100	65	—	—	—
Austria ..	1934	75	90	65	—	—	—
Switzerland ..	1935	70	100	57	—	—	—
Czechoslovakia	1932	—	—	—	5·1	7·0	4·4
Hungary ..	1933	—	—	—	5·4	7·3	3·2
Belgium ..	1934	80	100	—	—	—	—
U.S.A., Bridges	1936	89	89	67	7·1	7·1	5·3

Buildings

In England, welding is used throughout the roofing structure of Elm Park station on the L.M.S. Barking line, and welded plate girders of 54 ft. span, for an applied load of 300 tons, are used in the L.N.E. Railway Hotel at Hull. In Germany, welded station buildings and platform roofs are now so numerous as to be a common sight on almost any railway journey. A welded signal gantry 110 metres (about 361 ft.) in length is in service at Nuremberg main station.* The welded station halls of the Duisburg and Düsseldorf main stations are outstanding examples of the new architecture of welded steel structures.† At the time of writing, the station buildings at the Zoological Gardens, Berlin, are in course of erection by welding.

Bridges and Their Strengthening

Welding has been used extensively in England for many years past in the strengthening of bridges‡ with marked success, and prospects are favourable to its increased utilisation in the building of new bridges. Bridge girders 57 ft. 5 in. in length, 5 ft. 1 in. deep, with 12 in. flanges, were built by arc welding at the Stratford works of the L.N.E.R. for use in a footbridge spanning the L.M.S. Railway at Hackney Downs.§

In Germany, the construction of welded plate girders 61·7 metres (202 ft. 6 in.) in length for the Stralsund bridge represents an achievement excelling in many respects the plate girders of 52 metres (170 ft. 7¼ in.) span for the other Rügendamm bridge (The Railway Gazette, September 27, 1935). The new 202½-ft. continuous plate girders are 3·82 metres (12 ft. 6¾ in.) in depth and each weighs 102 metric tons (100 tons 8 cwt.). For the above-mentioned Zoological Gardens station, Berlin, the Hardenbergstrasse is crossed by an all-welded two-pin frame of 50.28 metres (165 ft.) span.‖ Plate girders of such dimensions are now built on site, using special clamping devices capable of rotation to permit each joint to be welded in the most favourable position.

The variety, extent and technical excellence of present-day applications of welding in the railway field are remarkable, considering that it is only a few years since the change-over to welding was begun slowly and with considerable trepidation. The preceding notes on some of the more important constructions, indicate the progress that has been made and the great and growing importance of modern welding technology to the railway engineer.

* *Bauingenieur* (Berlin), April 17, 1936.
† O. Bondy, *Welding Industry*, July, 1935.
‡ H. J. L. Bruff, *Electric Welding* (London), 1935.
§ *Electric Welding* (London), June, 1936.
‖ Schaper, *Bautechnik* (Berlin), January 3, 1936.

MODERN METHODS OF FINISHING RAILWAY VEHICLES—I

A review of present day paint shop practice

By H. N. BASSETT, A.I.Mech.E.,
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MUCH attention has been given of late years to the decorative finishing of railway vehicles. At one time coaches were finished with substantially the same materials and with as much care as private carriages, but nowadays there is no time for such elaborate processes and every endeavour is being made to shorten the time which vehicles spend in the paint shop. Attempts are also being made to produce materials of more lasting finish so as to lengthen the interval between complete repaints. It is not usual to repaint completely at the periodical shopping, but even when only a partial repaint is carried out there is some economy to be realised by the adoption of the very latest materials and methods.

Many different finishes are now available both for interior and exterior work. Limitations of space forbid detailed consideration, but so far as can be done briefly the points requiring special attenion in each will be explained. Inasmuch as a good deal of rolling stock is still of wood, chiefly teak, which is finished in varnish only to preserve the natural grain and colour of the wood, this will be dealt with first.

Teak is a particularly oily wood and for this reason a special varnish is often used on it. Gold size can be used instead as a sealing coat, but whichever is selected it requires rubbing down when hard and a covering coat of flatting varnish. This is allowed to harden and is then rubbed down, after which another coat of the same varnish is applied, followed by two or three coats of the finishing varnish, lightly rubbed down between each coat. This is a lengthy process, but the results are excellent if the work is conscientiously done. The coats may be either sprayed or brushed, but it is recommended that the final coat be brushed.

Good Varnishes Essential

To obtain the results which such a lengthy process demands it is essential to use only good varnishes. Tests have shown conclusively that cheap varnishes do not wear well. They lose their gloss very quickly, and in some instances it was found that the coating practically disappeared in eighteen months, whereas in the same time a high quality varnish lost only a little of its gloss and none of its film thickness.

The old type varnish is made of resins and gums cooked in linseed oil, and its manufacture is largely a matter of experience. The gums are natural products which vary quite a lot in quality, and much reliance must be placed on the judgment of the varnish maker. That this is not misplaced is illustrated by the uniformity of the products supplied by the older firms. It was reasonable, however, that attempts should be made to substitute synthetic resins for natural ones, as the former are made from pure chemicals under carefully controlled conditions and hence do not vary from time to time like the natural products. The synthetic resins used for varnish contain a proportion of natural resins, and therefore suffer to some extent from the disadvantages attaching to the natural material.

A varnish made from oil and synthetic resin of this type was still akin to the older varnish—a solution of resin in oil. Hence it was still liable to variation, not merely because of the potential variability of the resin, but also because linseed oil varies in quality. The next step therefore was to replace the oil, and this has been done with complete success by the production of " oil-modified " synthetic resins ready to use without cooking in oil. These media are made largely from pure chemicals and their manufacture can be controlled very closely indeed. The type most used in general decorative work is the glyptal, and this is the one applied to coach finishing.

To secure a good finish, whether on wood or steel, the most important matter is the preparation of the surface. If a paint remover has been used, the surface is certain to be greasy or waxy in places, and must be cleaned with turpentine or petrol or the film will not adhere. This is equally important with new steel stock, and the plates should be thoroughly well rubbed down with a wire brush or steel wool after cleaning with turpentine. It is desirable that mill scale on new plates should be removed, for which purpose sandblasting has proved effective. The surface left proves an excellent anchorage for the paint. Galvanised sheets are difficult to paint, but it has been found that by sandblasting the surface sufficiently to remove the spangled appearance, the loss of zinc is negligible and the paint takes well.

Application of a priming coat is the next step. Tests under widely varying climatic conditions indicate the superiority of red lead for this purpose on black sheets. A word of warning is justified here about painting over rust. In certain circumstances this may be done, but only rarely, as sooner or later the rust extends beneath the paint film and causes its failure by blistering. For really good work it is essential to clean the steel properly before painting is begun. In new construction, parts which are inaccessible later in the life of the vehicle—backs of panels, &c.—should be treated with a special protective paint. One in use in America contains a pigment consisting of lead, zinc, carbon and iron oxide pigments ground in pure linseed oil, and it has been found very satisfactory over long periods.

Brushing *versus* Spraying

Particular care should be taken that the primer covers every part of the surface, whether wood or steel. Brushing is preferable to spraying, as the latter does not always fill crevices well. These crevices will be covered with filler later in many instances, but even so the primer is a necessity under the filler. The primer should be of the quality recommended by the makers of the covering coats, as research has shown that all priming materials are not equally satisfactory under all finishing coats. Where stopping is necessary, it is done after the filling coat, which may be sprayed. The stopping should be mixed with oil if an oil primer and filler have been used.

The filler coat is followed by a guide coat, which is well rubbed down before the sealing coat is applied, and this is followed by the undercoating. This is rubbed down lightly before application of the finishing coat, and if the vehicle is not to be varnished a second coat is put on top of the first. When varnishing is the last stage, the final colour coat is well rubbed down first.

The method of painting described will give a life of upwards of three years before any attention at all is needed. At the end of the usual period, normally about

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two years, coaches come in for general examination and the bodies are washed down, lightly sanded and a fresh coat or coats of colour given, followed by two coats of varnish. After this the vehicle is returned to service for a further period, the process being repeated at similar intervals until it is thought desirable to clean off the whole of the paint and repaint completely.

The method of application is not important except for the primer and the final varnish coat. Spraying is quicker than brushing, and is equally satisfactory for all but the two coats mentioned. Experience has indicated that brushed varnish coatings are more satisfactory than sprayed ones. Finishing enamels are now available which make it possible to dispense with the final varnish coat, but for railway work where running conditions are severe and cleaning operations somewhat drastic, varnishing is recommended.

Synthetic Paints and Varnishes

In general the processes outlined apply equally to oil paints and varnish of the old type, and to the newer synthetic paints made up on synthetic resins; the results are closely comparable. Synthetic clear varnishes have been found to have a longer life than oil varnishes of the original type, and the synthetic finishes are also rather more flexible in the film. This means that they are less likely to fail by cracking, which is the usual type of failure. They usually give way by a gradual degradation of the surface, which merely needs rubbing down to give a good surface for repainting or varnishing. It is better to make use of the specially compounded primers and fillers when the finishing coats are to be synthetics, though reasonably good results can be got with the ordinary type of either primer or filler.

Nitro-cellulose paints, a somewhat general term now, are widely employed in the automobile industry, and their use is growing in railway work. An average nitro-cellulose paint consists of several constituents, and the vehicle is a mixture of solvents for which most manufacturers have their own formulæ developed by research and experiment. The paints may be applied by brush or spray; the spray gun is generally used in automobile work, but for railway purposes both are used.

The cleaning down of the metal or wood surface is just as important as with the paints already discussed. The primer is usually compounded with oil. When the surface is bad and much filling is required, an oil filler is much to be preferred to one of the nitro-cellulose type, as an average nitro-cellulose paint film when dry amounts to 20 per cent. only of the volume originally applied, the remainder having evaporated. After the filler stopping is done, an oil stopper is required if oil bound filler and primer are used, and after rubbing down, an undercoat may be applied if necessary. The final coats, two or three of pigmented lacquer, are applied thinly, the results being much better with three thin coats than with two thicker.

For road vehicle work, it is advisable to use loose beadings wherever possible. The metal panels are fixed in the usual way, but the beadings are detachable. The spraying is completed and the body rubbed down, and polished after which headings, treated separately, are replaced and fastened with countersunk screws, the heads of the screws being touched up by hand. By this means an excellent finish is obtained, as the surface is polished right up to the beading, and the movement which is inevitable with such vehicles does not break the film between the bodywork and the beading. If detachable beadings are used, a damaged panel can be removed and repaired easily without affecting the rest of the panelling, which is often a considerable advantage. Transfers can be fixed in the usual way with good gold size, and may then be protected with a coat of oil varnish.

NEW LOCOMOTIVES FOR OVERSEAS RAILWAYS

These engines, built by Nasmyth Wilson & Co. Ltd., of Manchester, are of the 4-6-0 type for the Junagad State Railway, India, and the 4-8-2 type for the Gold Coast Railway

THE locomotives illustrated have been built by Nasmyth Wilson & Co. Ltd., of Patricroft, Manchester, to the instructions of Messrs. Robert White & Partners, Westminster, for service on the Junagad State Railway of India, and to the instructions of the Crown Agents for the Colonies for the Gold Coast Railway. The 4-6-0 locomotives, three in number, are non-superheated, and incorporate in their design boilers with wide fireboxes above the frames to permit of a larger grate area, an inferior grade of coal being used as fuel. The outside cylinders drive the middle pair of coupled wheels, and steam distribution is effected by piston valves actuated by Walschaert motion.

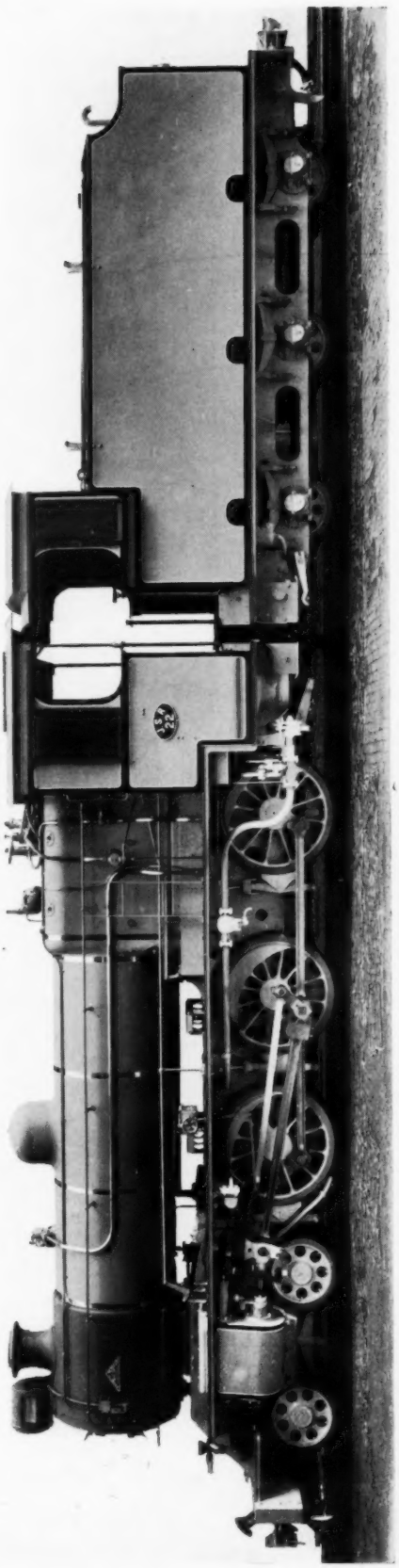
The tender is carried upon six wheels, 2 ft. 4½ in. diameter. It has a capacity of 2,200 gallons of water and carries 4 tons of coal. The engine develops a tractive force at 85 per cent. boiler pressure of 14,744 lb., and the ratio of adhesion to tractive force at 85 per cent. is 4·03. The engines are equipped with Pyle-National electric lighting apparatus; Ross pop safety valves; Clyde soot blowers; Evrit blow-off cocks; Davies & Metcalfe exhaust steam injector on the left hand side, and Holden & Brooke's injector on the right hand side; Lambert sanding; Wakefield mechanical lubricator; and Vacuum brake mechanism. Weight distribution and other particulars are shown in the drawings.

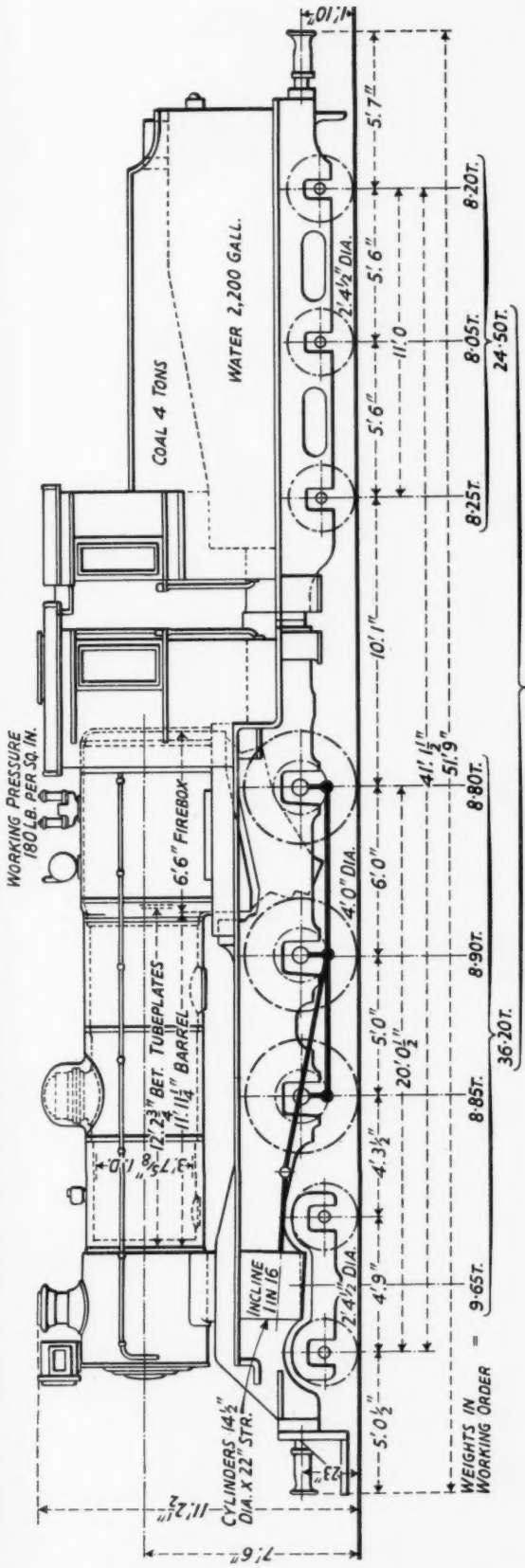
The following are the main particulars:—

Cylinders, dia.	14½ in.
Piston stroke	22 in.
Wheels coupled, dia.	4 ft.
,, ,, bogie, dia.	2 ft. 4½ in.
Wheelbase, rigid	11 ft.
,, engine	20 ft. 0½ in.
,, engine and tender	41 ft. 1½ in.
Boiler dia. inside the front	3 ft. 7⅜ in.
,, height at centre from rail	7 ft. 6 in.
Working pressure	180 lb. per sq. in.
Heating surface :—	
Tubes	935 sq. ft.
Arch tubes	9 ,,
Firebox	87 ,,
Total	1,031 sq. ft.
Grate area	20·7 sq. ft.
Weight in working order, engine	36·2 tons.
,, ,, ,, tender	24·5 ,,
Total	60·7 tons.
Adhesion weight	26·55 tons.

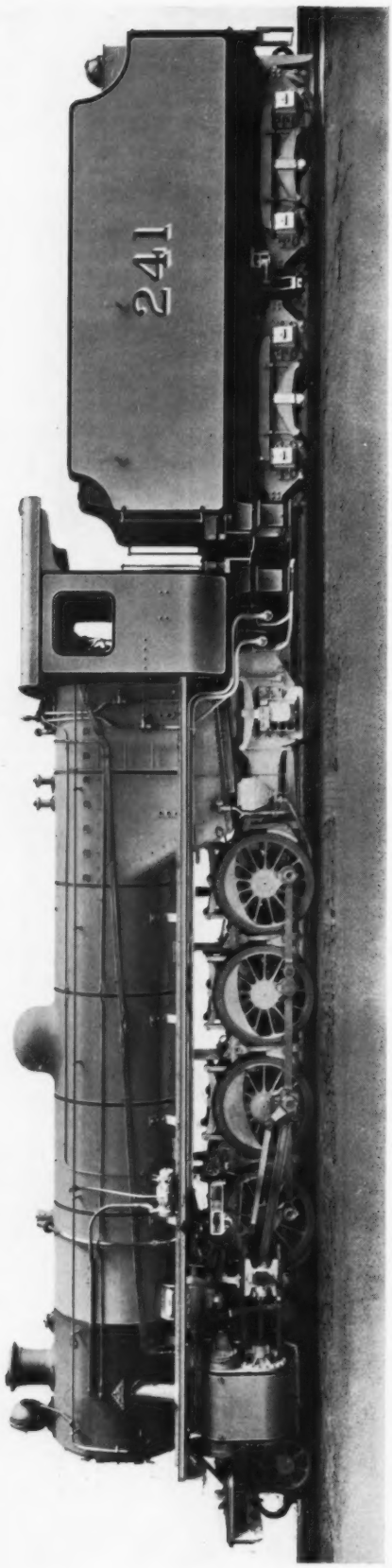
Gold Coast Railway Engines

These, as seen, are of the bar frame 4-8-2 type with eight-wheeled double bogie tenders, the gauge of the railway in this case being 3 ft. 6 in. As in the design described above, the cylinders are outside the frames

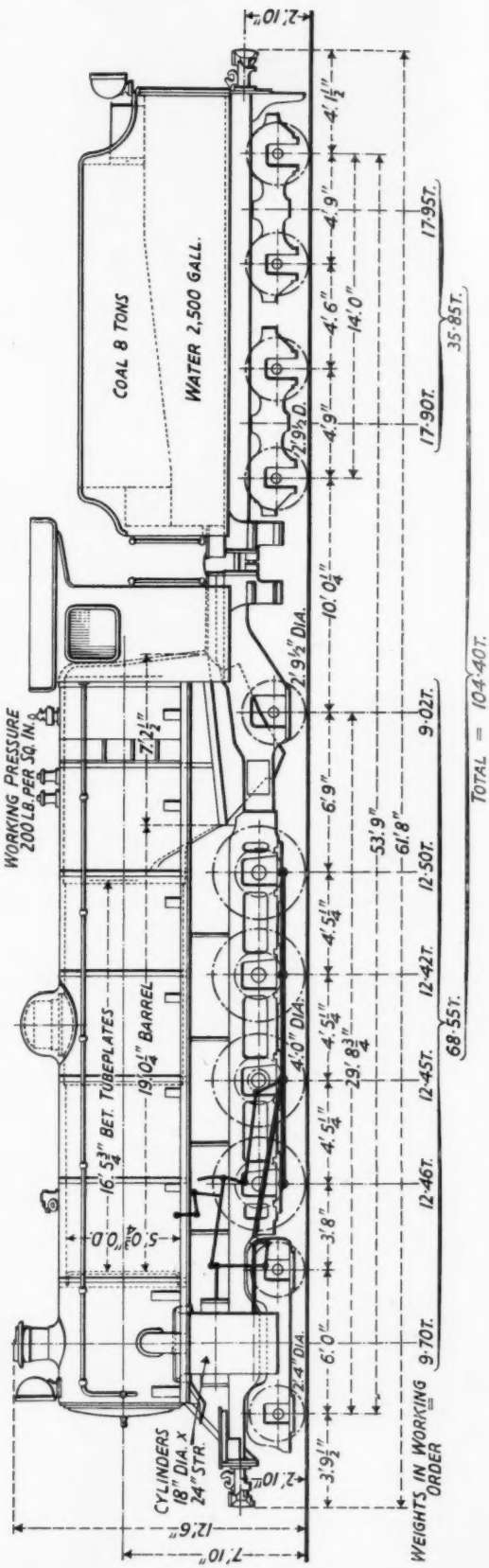




General view and dimensioned drawing of new 4-6-0 engines for Junagad State Railway



New 3-ft. 6-in. gauge 4-8-2 locomotive for the Gold Coast Railway



Dimensions and weight distribution of new Gold Coast 4-8-2 locomotives: note the bar frame construction

and steam distribution is by means of piston valves and Walschaert valve gear. The boiler in this design incorporates superheating apparatus and carries a working pressure of 200 lb. per sq. in. It has a diameter of 5 ft. 0¾ in. outside the front and a length of 16 ft. 5¾ in. between tube plates; other principal dimensions are as shown in the table alongside.

The maximum load on one pair of wheels is 12·5 tons. At 85 per cent. boiler pressure a tractive force of 27,540 lb. is developed. The tender has a water capacity of 2,500 gallons and a coal capacity of 8 tons.

The equipment includes the following fittings: Superheater Co. Ltd. M.L.S. superheater with 18 elements; Lockyer balanced regulator; Ross pop safety valves; Gresham & Craven injectors and combined heater, stop valve and b.p. valve; Clyde soot blower; Detroit sight-feed lubricator for cylinders; Lambert wet sanding; J. Stone & Co. Ltd. electric light equipment; Hasler speed indicator and recorder with drive taken off the coupling rod; steam brake on the locomotive and Vacuum brake and hand brakes on the tender; A.B.C. couplers; Phosphor Bronze Co. Ltd. bushes for coupling and connecting rods; Hoyt Metal Company's anti-friction metal; Wakefield's mechanical lubricator for axleboxes; and United States Metallic Packing Co. Ltd. cylinder packings.

Cylinders, dia.	18 in.
Piston stroke	24 in.
Wheels, coupled, dia.	4 ft.
,, ,, leading bogie	2 ft. 4 in.
,, ,, trailing bogie	2 ft. 9½ in.
Wheelbase, rigid	13 ft. 3¾ in.
,, engine	29 ft. 8¾ in.
Wheelbase, engine and tender	53 ft. 9 in.
Heating surface :—	
Boiler tubes	1,040 sq. ft.
Flue tubes	408 ,,
Firebox	160 ,,
Superheater elements	298 ,,
Combined total	1,906 sq. ft.
Grate area	34 sq. ft.
Weight of engine in working order	68·55 tons.
,, tender in working order	35·85 ,,
,, engine and tender in working order	104·4 ,,
Adhesion weight	49·83 ,,

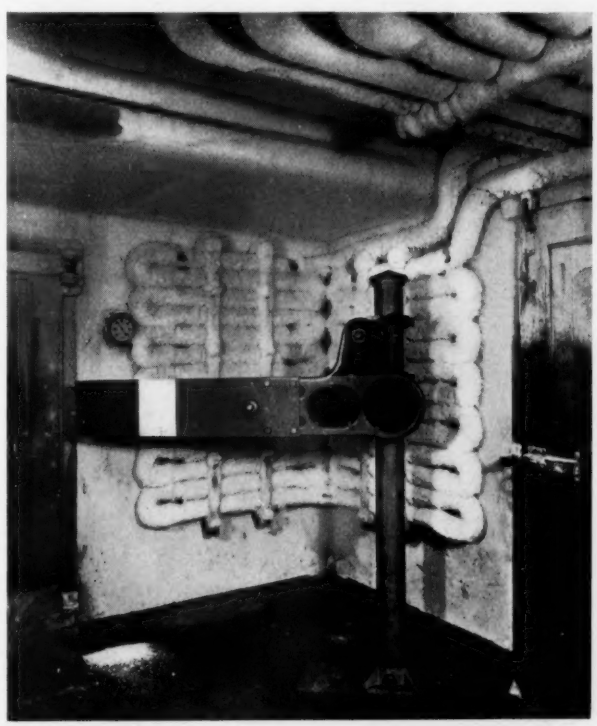
REDUCING THE EFFECTS OF ICE AND SNOW

A liquid chemical is now available that will prevent the freezing of railway equipment such as signals, points and electric conductor rails

THE Kilfrost Manufacturing Co. Ltd., of Albion Works, Albion Street, London, N.1, has during the last few years been making a particular study of ice formation and deposit, particularly in connection with the problems of cold storage, and has introduced a number of products intended to diminish the effects of frost where they are harmful to industrial efficiency. The formation of snow and ice on the pipes in cold chambers of refrigeration plants, which in the course of time assumes considerable proportions, diminishes the efficiency of the equipment, and necessitates defrosting at intervals. This is not easy to effect and involves putting the plant out of action for a certain time, while the actual removal of the deposit is a tedious and awkward process, the ice adhering firmly to the pipes. Kilfrost paste, one of the principal products of the above concern, when applied to the pipes in the prescribed manner prevents the snow which is formed congealing to ice, and allows defrosting to be carried out with comparative ease without stopping the plant. Trials made in refrigerating chambers of the Port of London Authority and other owners have given the most satisfactory results and enabled the efficiency of the plants to be raised materially, while costs have been reduced.

The Kilfrost Manufacturing Co. Ltd. has also turned its attention to the railway field, and introduced some additional products, adapted to meet difficulties peculiar to railway working in winter, when signal and other fittings are liable to become affected and the permanent way, both on steam and electric railways, has to be kept clear, especially points and crossings. Accidents have, of course, been known to occur through signal apparatus becoming seized up by frost, and the smothering of spectacle glasses by frost and snow may seriously interfere with the visibility of the lights.

There are six Kilfrost products for railway use. The signal lubricant, which can be applied to internal bearings by grease cups if necessary, is designed to keep spindles and pins free; trials in laboratory temperatures of −30° F. and lower have shown the remarkable effectiveness of the material. The signal solution is for keeping spectacle glasses clear, and one liquid ounce will melt 8 oz. of snow, which represents, on 50 sq. in. of glass, a fall of 0·8 to 2 in., according to the weight and type of snow falling. It is applied by drip feed to the glass. The points lubricant prevents points freezing up, and maintains



Semaphore signal in a cold storage room with a holding temperature of 30° F.

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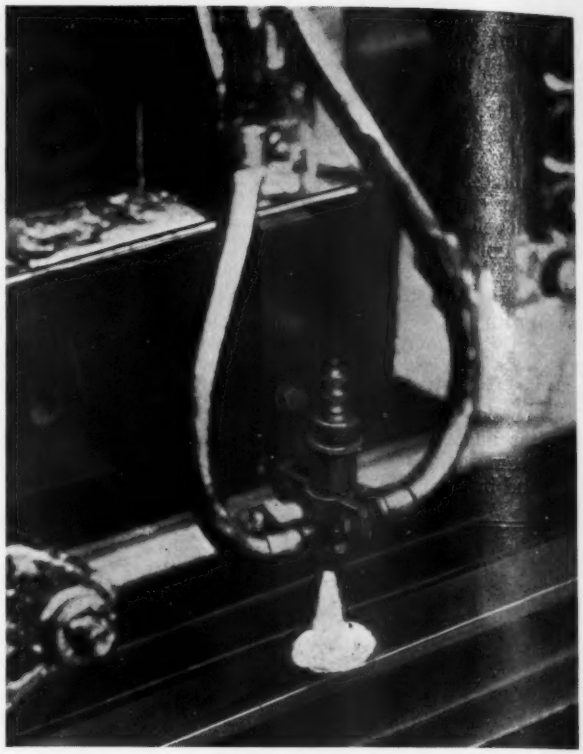
its qualities under the lowest temperatures, remaining unsolidified under extraordinary degrees of cold. The point solution is for melting snow and ice; one liquid ounce will melt 4 oz. of snow and maintain 8 oz. in a soft condition down to −30° F., so that 1 gallon will deal with 1 in. fall of snow on 80 to 192 sq. ft., and 100 to 200 points can be treated at this rate. This solution is liquid down to −60° F., and is entirely non-corrosive. Very satisfactory results are stated to have been obtained with it already.

For electric railways, two Kilfrost products are now available, designed to eliminate third rail troubles in winter, known as Solutions Nos. 1 and 2. The first is for use where temperature does not generally fall below −5° F.; the second for more severe conditions, down to −50° F. The solutions are applied to the conductor rail, as traffic conditions permit, from a suitable reservoir on a vehicle, in the form of a narrow ribbon, which will slowly cover the rail head. This can be done effectively at a speed of 20 m.p.h. Application of the solution after general traffic has ceased will melt any ice present and prevent further ice forming long enough to allow a full day's running without further application. The material, being non-corrosive, will not harm rubber feed pipes. The No. 2 solution has a more rapid action, being able to melt ¼ in. of ice in 5 min., and is very suitable for cases where sleet is followed by a sudden fall of temperature and iced rails result. If applied warm, far enough ahead of the collector shoe, it will defrost the rail as a car proceeds.

It is understood that the London Passenger Transport Board has found the Kilfrost material to be quite effective in maintaining live rails clear on exposed sections of line.



Kilfrost being applied to a conductor rail on the London Transport system

A recent picture of the Royal Scot climbing Shap, which strikingly illustrates the smooth exterior surface of the latest L.M.S.R. coaching stock, a notable contribution to the reduction of wind resistance Photo.] [M. W. Earley

WELDED UNDERFRAMES FOR L.M.S.R. GOODS WAGONS

Procedure adopted in welding thirty-five underframes for 12-ton covered goods wagons at Crewe works

THIRTY-FIVE underframes for 12-ton covered goods wagons have recently been completed at the Carriage and Wagon Works of the London Midland & Scottish Railway at Wolverton; these are of almost entirely welded construction. The underframes are of standard pattern, light type, not fitted with continuous brakes, and conform generally to R.C.H. dimensions and requirements, with slight modification to suit welded construction. The underframe has a length of 17 ft. 6 in. over headstocks, and a width of 7 ft. 8 in. over side rails, with an extreme width of 8 ft. 4 in. over door angles. The wheelbase is 10 ft. and the wheels are solid rolled, with a diameter of 3 ft. 1½ in. on tread. Brakework, springs, draw and buffing gear, and other fittings, are standard.

The main members are identical with those used on the riveted wagon, and are of the new B.S. rolled steel section, as follows:—

Solebars, headstocks and crossbars: 9 in. × 3$\frac{1}{16}$ in. × $\frac{3}{8}$ in. channel.

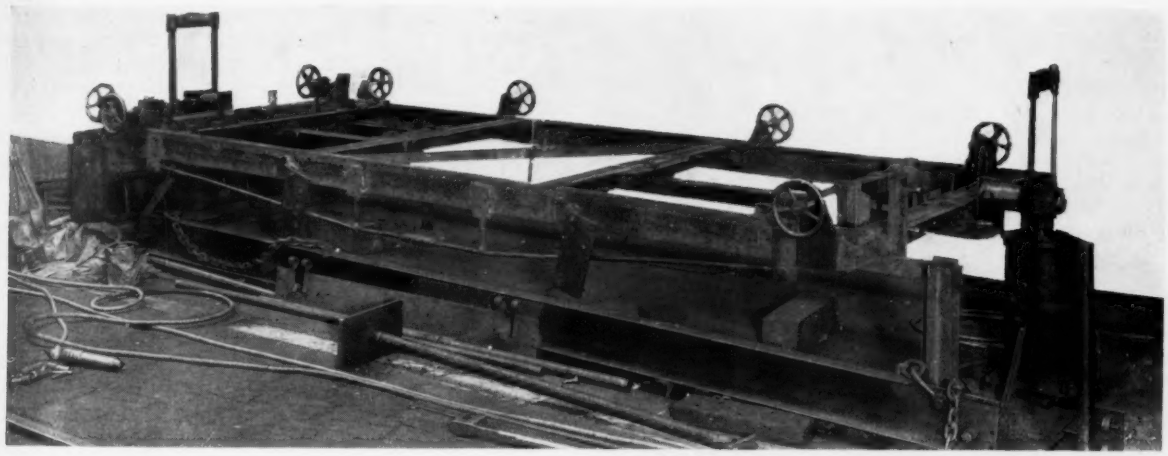
Diagonals, longitudinals and diagonal headstock stays: 6 in. × 3 in. × $\frac{1}{2}$ in. channel.

Side rails: 2½ in. × 2½ in. × $\frac{5}{16}$ in. equal angle

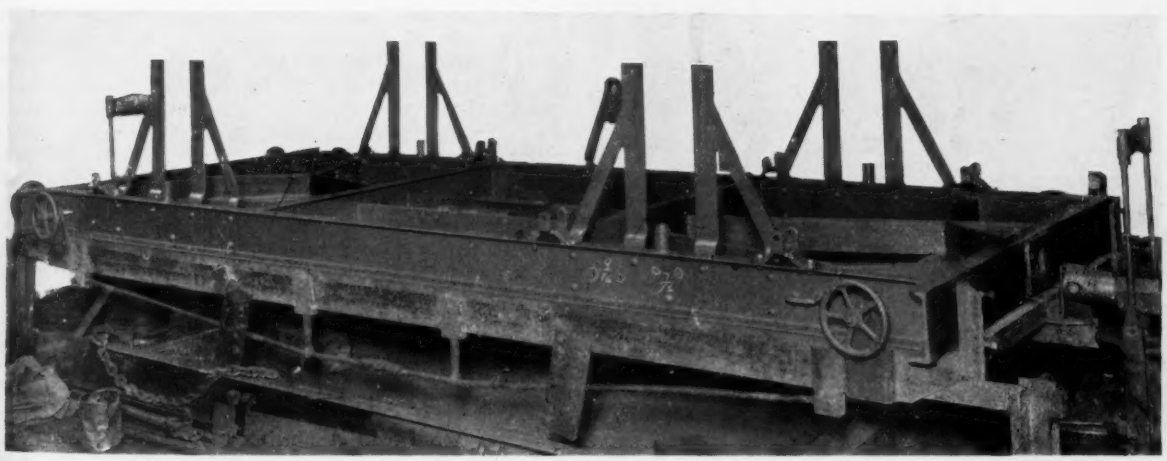
From the illustrations it will be seen that the rolled steel sections are electrically welded together, the only riveting being on such parts as require renewal or removal, including the axleguards and part of the brake gear; the sole exceptions are the brake block hanger brackets. A layout has been prepared for a complete and entirely progressive system of welded construction at Wolverton, whereby several jigs will be used, and the assembling and welding carried out more intensively and rapidly.

Details of Welding Process

The constructional members were sawn or milled to form a close abutment in the underframe, the meeting edges being chamfered where necessary. The crossbars, longitudinals and drawbar cradle carriers were assembled in a jig, tack-welded, then welded and removed from the jig.



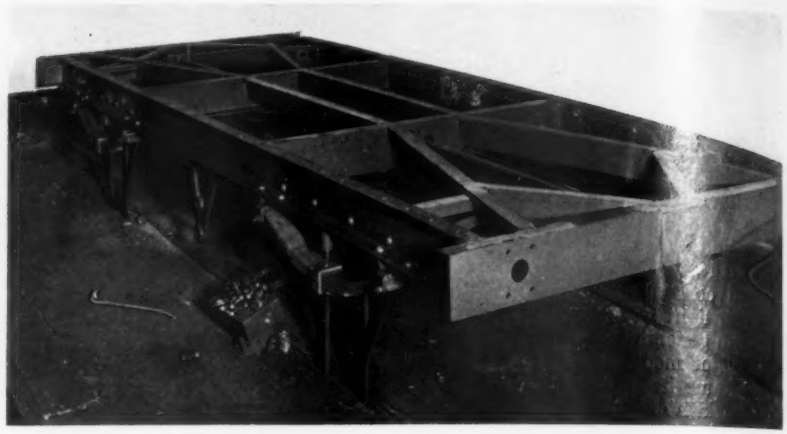
Jig No. 2 used for principal welding operations



The underframe in jig No. 2

This welded section, and the whole of the remaining main members to be welded, were next assembled in the large jig, shown in the first illustration on the preceding page. From this it will be seen that the jig is arranged to revolve on trunnions, enabling the welds to be made horizontally as far as practicable.

With work proceeding at both ends simultaneously, the headstock and diagonal stays were first tack-welded to the diagonals and headstock, and the diagonals tack-welded to crossbars and headstocks, the welding following in the same sequence. The solebars were next partially welded to the headstocks, welding of the solebars and crossbar flanges following, welding of the solebars and crossbars, longitudinals, and crossbar webs coming next. The trend of operations at this stage was to work outwards from the centre of the underframe to eliminate distortion. The stays were next completely welded to the diagonals and the diagonals to headstocks, followed by welding the inner flanges of diagonals and crossbars, and stays to headstocks. The jig was rotated as required to complete the whole of the foregoing operations.



Underframe after removal from jig No. 2

Various items to be welded to the underframe were next dealt with. The drawbar plates were welded to the headstocks, and the four buffer trimmers, each a fabricated fitting, were first tacked, then welded to diagonals, and solebars. Spring stops, rope hooks and one vee-hanger, were tacked to the solebars, and the jig rotated to complete this series of operations. The progress thus far is shown in the second illustration.

Before removal from the jig, the axleguards, which had been riveted to the solebars prior to the welding operations, were set and lined up, and the springs mounted and coupled up. At this stage, the underframe, as next shown, was removed from the jig, and any welding hitherto inaccessible completed, no particular sequence being here observed. The side rails were then carefully lined up, and gauges inserted together with the necessary distance pieces, and welded first to the solebars and then to the headstocks; the stays were afterwards welded. No particular order was necessary, and this completed the welding of the underframe structure.

Welded steel wagon frame after testing

The corrugated steel ends of the wagon body, already prepared by welding the upper and lower halves, and the several stanchions with their door stops, weather strips, and other individual fitments welded on, were placed in position on the underframe. Their relative positions having been determined by a complete set of gauges and trammels, they were cramped together, and the steel ends were first tack-welded to the outer side of the headstocks, then completely welded on the inside to headstocks and side rails, followed by welding of the stanchions.

The whole of the welding was carried out at an amperage varying from 175 to 180; the fillet weld sizes were $\frac{5}{16}$ in., $\frac{1}{4}$ in., and $\frac{3}{8}$ in. A saving of 5 cwt. in weight over the riveted prototype has been realised.

Shunting Tests

One of the welded wagon underframes on completion was subjected to shunting tests. First the frame was sent into a train of condemned wagons. The average speed over a distance of 88 yd. prior to impact was 15 m.p.h. In this test the wheels became derailed, three axleboxes were broken, and two bolt heads on the vee hanger sheared off. No one joint in the frame showed any sign of failure. After re-railment the frame was again tested. This time a goods brake was attached to it, trailing. The frame was again sent into a train of condemned wagons at an average speed over 88 yd. of 35 m.p.h. In this gruelling test all the axleboxes were shattered and the wheels shot from under the frame. Only two joints showed any signs of failure, these being adjacent to each other at one of the junctions between crossbar, longitudinal, and diagonal. Some idea of the forces set up, due to this severe method of testing, can be gathered from the concluding illustration.

We are indebted to Mr. W. A. Stanier, Chief Mechanical Engineer, L.M.S.R., for the foregoing description and the originals from which the illustrations have been prepared.

RAILWAY NEWS SECTION

PERSONAL

We regret to record the death on November 27 of Mr. Bernard Bowles Harrison, a Director of Harrison & Sons Limited, the firm that has printed THE RAILWAY GAZETTE for a long period of years. Mr. Harrison, who died at his home, Tunbridge Wells, in his seventy-ninth year, was buried on Tuesday, following the funeral service at St. James's Church, Tunbridge Wells.

G.W.R. APPOINTMENTS

The following appointments are announced by the Great Western Railway:—

Mr. H. G. Johnson, Draughtsman, Swindon, to be Assistant to Locomotive Works Manager, Swindon.

Mr. A. W. J. Dymond, Draughtsman, Swindon, to be Assistant to Divisional Locomotive Superintendent, Cardiff.

Mr. W. Pratt, Repairs Engineer, Park Royal, to be Assistant (Electrical) to Divisional Locomotive Superintendent, Wolverhampton.

Mr. W. J. Stanley, Shift Engineer, Park Royal, to be Assistant (Electrical) to Divisional Locomotive Superintendent, Bristol.

Mr. J. I. Membery, Shift Engineer, Park Royal, to be Assistant (Electrical) to Divisional Locomotive Superintendent, Worcester.

Mr. J. V. Howe, Shift Engineer, Park Royal, to be Assistant (Electrical) to Divisional Locomotive Superintendent, Oswestry.

We regret to record the death, on November 27, of Mr. Robert Hugh Tennant, Chairman of the Audit Committee of the London & North Eastern Railway. He was best known as a Director, and from 1927-30 Chairman of the Westminster Bank. In addition to his banking interests he was Deputy Chairman of the Stanton Ironworks Co. Ltd.

We note with regret the recent death of Mr. G. B. Rea, sometime advisor to the Chinese Ministry of Railways.

Mr. Harris Watson, M.B.E., A.M.Inst.T., A.M.Inst. Public Administration, has been appointed to succeed Mr. A. R. Fearnley as General Manager of the Sheffield Corporation Transport Department, the administration which manages the largest joint railway-municipal bus undertaking in the country.

Mr. Harry Cheadle, Chief Traffic Manager, at present acting as Assistant General Manager (Commercial), South African Railways and Harbours, who, as announced in our issue of November 6, has been appointed by the Government of India as a member of the Indian Railways Inquiry Committee, was for five years a clerk on the former London & North Western Railway. He then joined the service of the railways in South Africa on October 28, 1902, as a clerk in the Assistant Traffic Manager's office, Pretoria. He was transferred to headquarters, Johannesburg, in 1906 and, with the exception of a short period during which he was stationed at Bloemfontein, remained in Johannesburg until 1920, when he was promoted to the position of Assistant Superintendent (Commercial and Operating), Durban, rising to the position of Superintendent Operating some three years later. Mr. Cheadle held the position of System Manager at Kimberley and at Pretoria prior to his transfer to Johannesburg on December 11, 1933, to take up his present position as Chief Traffic Manager. He saw considerable active service during the Great War and was awarded the Distinguished Service Order and the Military Cross. He joined the Forces as a private, and at the conclusion of hostilities held the rank of Major.

Mr. H. Cheadle, D.S.O., M.C.,

Chief Traffic Manager and Acting Assistant General Manager (Commercial), South African Railways and Harbours, appointed a member of the Indian Railways Committee of Inquiry

INDIAN RAILWAY STAFF CHANGES

Mr. T. H. Morris, on return from leave, assumed charge as Controller of Stores, B.-N.R., as from November 1. Mr. R. M. Innes, who had been acting for him, reverted to Deputy Controller of Stores.

Mr. J. Mackinnon, on return from leave, has been appointed Deputy Agent, N.W.R.

Mr. H. Wood Robinson, on return from leave, has resumed his duties as Deputy Chief Engineer, Bridges, N.W.R.

Mr. H. W. Huggins has been appointed to officiate as Deputy Chief Mechanical Engineer, N.W.R.

Commander E. S. Graham, on return from leave, assumed charge as Marine Superintendent, B.-N.R., as from October 31.

Mr. E. V. M. Powell has been appointed to officiate as Deputy Carriage and Wagon Superintendent, Burma Railways, as from October 8.

Mr. J. H. Shiels has been appointed to officiate as Chief Electrical Engineer, Mechanical Department, G.I.P.R., as from October 5.

Mr. R. C. Case has been appointed to officiate as Deputy Chief Controller, Standardisation (Mechanical), Railway Board, as from October 16, in place of Mr. T. G. Creighton, granted 10 months' leave.

Mr. R. W. Taylor has been appointed to officiate as Deputy Chief Engineer, South, E.B.R., as from October 15.

Mr. G. H. A. Wood has been appointed to officiate as Deputy Chief Accounts Officer, E.B.R., as from October 8.

Mr. E. H. N. Lowther, Officiating Deputy Agent, Personnel, E.I.R., has been granted 10½ months' leave as from December 4.

Mr. S. J. Hungerford, Chairman and President, Canadian National Railways, has announced the appointment of Mr. N. B. Walton as Chief of Transportation of that system with headquarters at Montreal. Mr. Walton has been General Superintendent of Transporta-

tion, Western Region, with headquarters at Winnipeg, since March, 1930, and is well known as a railway operating officer of wide experience. He was born in London, Ontario, and

Mr. N. B. Walton,

Appointed Chief of Transportation, Canadian National Railways, with headquarters at Montreal

has been active in railroading since 1900, when he joined the Grand Trunk Railway at Toronto, as a clerk and stenographer, subsequently and until 1907 occupying positions of Secretary to Superintendent, Telegraph Operator and Secretary to the Vice-President, and Assistant Trainmaster. In that year he transferred to the Great Northern Railway at St. Paul, as Secretary to the Vice-President and later Inspector of Transportation, returning to the Grand Trunk system at Toronto in April, 1908, as Claims Agent. In October of the same year Mr. Walton became Secretary to the General Superintendent of the Grand Trunk Pacific Railway at Winnipeg and served subsequently as Trainmaster at Wainwright, Alberta, Assistant to the General Superintendent at Winnipeg, and Superintendent at Edmonton. In September, 1920, he became Assistant General Superintendent, Canadian National Railways at Prince Rupert, British Columbia, and was transferred to Winnipeg in 1924 as General Superintendent, being appointed General Superintendent of Transportation, Western Region, in March, 1930, the post he has now vacated to become Chief of Transportation.

Canadian National Railways Appointments

Following the appointment of Mr. N. B. Walton as Chief of Transportation, the following other changes in the Operating Department are also announced :—

Mr. W. R. Devenish, General Superintendent, Manitoba District, is appointed General Superintendent of Transportation, Western Region, with headquarters at Winnipeg.

Mr. B. T. Chappell, General Superintendent, British Columbia District, to be General Superintendent, Manitoba

Mr. Percy S. Turner,

Sales Director, Metropolitan-Vickers Electrical Co. Ltd., who has been decorated with the Hungarian Order of Merit

District, with headquarters at Winnipeg.

Mr. W. T. Moodie, General Superintendent at North Bay, to be General Superintendent, British Columbia District, with headquarters at Vancouver.

Mr. W. I. Munro, General Superintendent, Alberta District, to be General Superintendent, Saskatchewan District, with headquarters at Saskatoon.

Mr. W. C. Owens, General Superintendent, Saskatchewan District, to be General Superintendent, Alberta District, with headquarters at Edmonton.

The Canadian National Steamships announce the appointment of Mr. Norman A. Paton to the position of Assistant to Passenger Traffic Manager. Mr. Harry T. Parker, formerly Special Passenger Representative for the company, has been appointed Passenger Representative in charge of Montreal territory.

Mr. Percy S. Turner, Sales Director of the Metropolitan-Vickers Electrical Co. Ltd., has been presented by the Regent of Hungary with the Cross of the Hungarian Order of Merit, in connection with his well-known work concerning the electrical equipment of the Hungarian State Railways. We congratulate him on his being the recipient of this honour, and also upon his recovery from the very severe illness which has incapacitated him for some months.

Mr. J. Irving, for over 20 years Manager of the Cable Department at the Greengate and Irwell Rubber Co. Ltd., Salford, Manchester, and for the past eight years a Director of Rotunda Limited, Denton, Manchester, relinquished his position and retired from business altogether on November 30.

H.M. King Edward VIII leaving the sleeping car of the special G.W.R. train, which he made his headquarters during his recent tour of the South Wales distressed areas, at Llantwit Major station on November 18, to begin the tour

[Photo: "News-Chronicle"

From *The London Gazette* of December 1: Territorial Army; Royal Engineers; Engineer and Railway Staff Corps: The King has been graciously pleased to confer the Efficiency Decoration upon Col. the Lord Ashfield, P.C., and Lt.-Col. R. E. L. Maunsell, C.B.E., M.I.Mech.E., M.A.

Col. Lord Ashfield is Chairman of the London Passenger Transport Board, and Lt.-Col. Maunsell is Chief Mechanical Engineer, Southern Railway.

The King has been pleased to issue a new Commission of Lieutenancy for the City of London (November 7, 1936) appointing *inter alia* as H.M.'s Lieutenants within the City: Viscount Wakefield, G.C.V.O., C.B.E., T.D.; Lord Ebbisham, G.B.E. (a Director of the Southern Railway); Sir Charles A. Batho, Bt. (a Director of the L.N.E.R.); Sir Henry D. Kimber, Bt. (a Director of the South Indian Railway); Sir Alan Garrett Anderson, G.B.E., M.P. (a Director of the L.M.S.R., Somerset & Dorset Joint Railway, &c.); Mr. Walter K. Whigham (a Director of the L.N.E.R., and Central Argentine Railway); Mr. Charles J. Hambro, M.C. (Deputy Chairman, G.W.R.); Sir Josiah C. Stamp, G.C.B., G.B.E. (Chairman and President of the Executive, L.M.S.R., and a Director of associated companies, &c.); Mr. P. Ashley Cooper, B.A., LL.B. (Member of the L.P.T.B. and a Director of the Beira Railway and of the Argentine Transandine Railway, &c.); Lord Palmer (Deputy Chairman, G.W.R. and a Director of associated companies); Col. Sir Robert Williams (a Director of the Benguela Railway, &c.); Lord Ritchie of Dundee (Chairman, Port of London Authority); Sir Francis H. Dent, C.V.O. (Chairman, Railway Clearing House, and a Director of the Southern Railway and associated companies); Sir Herbert A. Walker, K.C.B. (General Manager, Southern Railway, and a Director of Carter Paterson & Co. Ltd. and Pickfords Limited, &c.); Lord Plender, G.B.E. (Shareholders' Auditor, G.W.R.); and Hon. Col. the Hon. J. J. Astor (a Director of the G.W.R.).

L.N.E.R. MUSICAL SOCIETY CONCERT.—An enthusiastic audience enjoyed this society's bohemian concert at the Hamilton Hall, London, E.C., on Monday night, when a programme which varied from the rousing to the gently sentimental appealed to all tastes. Perhaps because it was a bohemian concert, and the item followed an interval for refreshments, the first outstanding display of enthusiasm greeted the "Drinking Song" from the "Rose of Persia," by Webster Booth. The conductor was Leslie Woodgate. Mrs. H. W. J. Powell took the chair. Among the visitors were :—

Sir Charles A. Batho; Messrs. E. Coleby, H. G. Drury, A. R. Gray, E. L. Hawkins, A. P. Howard, W. H. Hyde, R. J. M. Inglis, James M. McLaren; Col. H. H. Mauldin; Messrs. S. C. Maxfield, L. H. K. Neil, C. H. Newton, R. R. Pettit, H. W. J. Powell, M. D. Robinson, Percy Syder, and C. B. Tidmarsh.

Staff and Labour Matters

Meeting of Railway Staff National Tribunal

Much interest has ben aroused by the announcement that the Railway Staff National Tribunal will meet on Monday next under the chairmanship of Sir Arthur Salter, K.C.B., D.C.L., to hear and decide claims submitted by the Associated Society of Locomotive Engineers and Firemen. These claims, which are made on behalf of Engine Drivers, Motormen, Firemen, Assistant Motormen and Engine Cleaners, include the following :—

1.—The deduction of 1¼ per cent. from earnings to be discontinued.

2.—The standard day to be reduced to 6 hours and the standard week to 36 hours.

3.—Duty performed on Sundays to be paid for at the rate of double time, with a minimum payment of a standard day's pay for each time of signing on duty.

4.—Day overtime to be paid for at the rate of time-and-a-half and night overtime at the rate of double time.

5.—All ordinary time worked at night (*i.e.*, between 10 p.m. and 4 a.m.) to be paid for at the rate of time-and-a-half.

6.—Twelve weekdays holiday with pay to be given after twelve months' service.

The hearing will be in public and it is anticipated that it will occupy about three days.

Road Transport Hours

The Joint Council for the Retail Distributive Trades Section of the Road Transport Industry—an organisation representative of employers and workpeople—recently submitted an application to the Minister of Transport for a variation of the periods of time laid down in Section 19 of the Road Traffic Act, 1930, as amended by Section 31 of the Road and Rail Traffic Act, 1933, for the employment of drivers of road vehicles of certain types. The variation applied for is to the effect that the period of 11 hours laid down in Section 19 (1) (ii) of the Act of 1930 may be increased to 12 hours on any four days during the period December 15 to December 24, 1936, both days inclusive, the variation to apply only in England and Wales to those engaged in the delivery of goods from retail shops and/or stores to their customers. As provided in the Act, the Minister referred the matter to the Industrial Court for advice, and the Court met yesterday, Thursday, December 3, to hear arguments. The National Union of Railwaymen opposed the application on grounds of public safety.

Road Transport Wages

Another meeting of the committee appointed by the Ministers of Labour and Transport to consider the regulation of wages and conditions of service of persons employed in the Road Transport Industry (Goods) was held in London on Friday last, November 27, under the chairmanship of Sir James Ballie, O.B.E., J.P. LL.D. The Government committee received evidence submitted on behalf of the associated committee of "C" licence holders. "C" licences are held by "ancillary users," *i.e.*, those engaged in trade or business, for the carriage of goods only for or in connection with such trade or business. A vehicle authorised under a "C" licence may not be used for the carriage of goods for hire or reward. The associated committee is representative of seventeen national organisations, including the National Chamber of Trade, the National Federation of Building Trades' Employers, and the Wholesale Distributors' Association.

It was urged that there can be no real comparison between haulage contractors or railway companies, who carry goods "for hire or reward" and ancillary users operating their own vehicles, and it was submitted that the carriage of goods could not be handed over to public hauliers without damaging the trade or business. It was further submitted that failure on the part of certain "A" or "B" licence holders to comply with requirements as to fair wages and conditions is in part due to "C" vehicles not being subject to such requirements, cannot be justified upon the facts.

Other arguments advanced were that special treatment of motor drivers might upset the balance of any arrangements entered into in respect of other classes of employees in a particular trade; that many drivers are only employed part of their time in driving and at other times come within the category of shop assistants; and that many drivers engaged in retail delivery collect accounts and act as salesmen. The associated committee submitted in conclusion that it is impracticable to apply the fair wages clause to the case of the private carrier.

Mr. Herman Kent, who appeared for the associated committee stated, in reply to a question, that enquiry among members of the Grocers' Federation showed that the average wage of part-time drivers is 48s. 2d. per week and for full-time drivers is 52s. 10d. per week, the hours of employment in each group averaging 53 per week. Sir James Ballie asked the witness whether there was not some justification for a driver employed by a "C" licence holder objecting to his wages and conditions being less favourable than those determined by the National Joint Conciliation Board for the Road Transport Industry (Goods) in respect of "A" and "B" licences, and in reply it was suggested that the conditions of work were entirely different.

It will be remembered that in a memorandum of evidence recently submitted to the Government committee the four main-line railway companies urged that "C" licence holders should be made subject to appropriate control in the matter of wages and conditions of employment.

XUM

The Air Resistance of Passenger Trains

(See Editorial Article on page 932)

On Friday, November 27, a paper entitled "The Air Resistance of Passenger Trains" was read by Mr. F. C. Johansen, M.Sc. (Eng.) A.M.I.Mech.E., Engineering Research Officer to the London Midland and Scottish Railway, at a Meeting of the Institution of Mechanical Engineers. The paper was divided into three parts, and in the following summary the titles of these have been retained.

Part I.—Experiments

The paper was mainly a description of experimental work, both of the methods employed and of the results obtained, and at the outset the author explained that wind tunnel tests on scale models had been preferred to tests on full size trains, chiefly because it was impossible to control the natural wind, or to determine how much of the resistance of an actual train was air resistance, and how much was resistance of a different kind. Earlier workers had shown that air resistance was closely proportional to the square of the speed, and that at speeds exceeding 60 m.p.h., this resistance became, with trains of conventional design, the largest of all the items making up the total. The new experiments were performed to ascertain the air resistance of the separate vehicles comprising a train as well as of whole trains.

Conventional, modified and ideal train models were tested, and the velocity of the air relative to each model was varied both in magnitude and direction. The wind tunnel in which the experiments were made had a 7 ft. square internal cross section, and because they were, in some tests, to be placed making an angle of 30° with the air stream, model trains could not, in such a tunnel, be more than 11 ft. long. This restriction had dictated the use of trains consisting of a locomotive and six carriages constructed to a linear scale of a fortieth full size.

The train under test had been placed above a flat aluminium plate 14 ft. long and 7 ft. wide, placed horizontally in the tunnel midway between floor and roof to represent the ground. Through the centre of each vehicle comprising the train a rectangular sectioned hole had been provided in the longitudinal direction enabling the vehicles to be strung like beads on a straight metal rod of rather smaller rectangular section. This rod, supported parallel to the plate at its central point, and a few inches therefrom, was carried by balances, and the forces tending to move it parallel to the plate in both longitudinal and lateral directions had been rendered ascertainable by apparatus outside the tunnel. Vehicles comprising a train could be secured separately to the rod, and any not so secured could be fixed to the plate with the rod passing through but not touching them. In this way it had been made possible to measure the forces acting on whole trains or on individual vehicles, the remainder of the train being in its correct position relative to the vehicle under test. The inclination of the rod to the longitudinal axis of the wind tunnel had been adjustable, and so the longitudinal and lateral components of air resistance had been obtainable for resultant air velocities making an angle of up to 30° with the length of the train. This angle was referred to throughout the paper as the angle of yaw. In presenting the results of tests on models allowance was to be made for the small scale of the experiments in drawing conclusions applicable to full size trains. Aerodynamic theory enabled the allowance to be made but not without a possibility of error. However the author felt that the effects of modifications of train shape were likely to be less open to error from scale and similar differences than the absolute values of the air resistance. In other words wind tunnel tests on models gave comparative if not quantitatively accurate indications of the forces acting on full size trains of different shapes. For the sake of uniformity and ease of comparison the results given in the paper related to full size trains and were reduced to the common basis of a resultant speed of 100 m.p.h. between the train and the air.

Part II.—Results

The results given in the paper may be summarised so as to afford interesting comparisons. Tests on a conventional L.M.S. train and on a train of ideal shape having faired (rounded) ends, faired (shielded) chassis, perfectly smooth external surfaces, and closed-in gaps between vehicles, showed that a saving in the longitudinal air resistance of from 75 per cent. at 0° yaw to 85 per cent. at 30° yaw was to be effected by adopting the ideal shape. In actual horsepower the figures were from about 1,000 saved at 0° yaw, to about 2,700 at 30° yaw for a speed of 100 m.p.h. in still air. The lateral air resistance for both trains varied from zero at 0° yaw to between 40,000 and 50,000 lb., no saving in this having been secured by streamlining.

Regarding the longitudinal resistances of the separate vehicles it was found that for the conventional train the locomotive offered from about 2 to about 3 times the resistance of any other vehicle. The larger figure corresponded to 0° yaw when the locomotive would cleave a way for, and to some extent shelter, the rest of the train, and the smaller figure corresponded to 30° yaw, when the rest of the train was more exposed. The resistances of the carriages showed a tendency to become slightly greater as the back of the train was approached, this tendency being most marked at 0° yaw, when the sheltering action of the locomotive on the front of the train was greatest. However, the front carriage, inadequately covered, especially with larger angles of yaw, by the low tender of the engine, showed a resistance exceeding that of the midway carriages. At 10° and 20° yaw its resistance actually exceeded by a few pounds that of the last carriage, which, by reason of a suction or negative pressure effect on its rear surface, offered a resistance supplementary to that accruing from its other surfaces. It seemed evident from the figures that with the conventional train the greatest scope for reducing air resistance was offered by the locomotive though this depended on the number of carriages. Comparatively small savings were to be effected by leaving the locomotive unchanged and modifying the train. Not even the time honoured expedient of rounding the tail could in this instance effect any substantial improvement. The experiments on the ideal train showed an altogether different apportionment of the (far smaller) total air resistance among the separate vehicles. Now it was the last vehicle which showed the greatest resistance, even though this had its end faired. At 0° yaw the resistance of this was twice that of the locomotive, and nearly four times that of each of the other carriages. At 20° yaw the resistance of the locomotive had vanished and become negative (−168 lb.), while the resistances of the carriages, taken from front to back, were 350, 234, 186, 175, 169 and 457 lb. Between 20° and 30° yaw changes of the first importance occurred. The locomotive resistance had become −282 and the carriage resistances were 109, 369, 272, 228, 218 and 261 lb. respectively.

When improvements were made in the form of the conventional locomotive it was found that they reduced its sheltering influence on the train so that, while there was a saving in locomotive resistance, there was an increase in train resistance which partly offset this. After all then, the scope for improvement afforded by alterations in the locomotive alone was not as great as might have been expected.

The modifications made to the standard L.M.S. locomotive and tried out in the wind tunnel were minor ones which did reduce its resistance a little without causing any discernible increase in the train resistance. At 0° yaw a hemispherical smokebox front saved about 440 lb. of a total of 1,980 lb. This represented 22 per cent. of the air resistance of the locomotive, or 8·8 per cent. of the air resistance of a complete 6-coach train. At 30° yaw the saving was inconsiderable—about 100 lb. or less than 1 per cent. of the total train resistance.

The substitution of a high tender for a standard low tender led to a reduc-

tion in the suction effect on the engine cab, and produced a better shielding of the front carriage with the result that at 0° yaw it produced a saving of nearly 6 per cent. of the total resistance of a 6-coach train. At increasing yaw the saving became less substantial.

Comparison between a six carriage conventional L.M.S. train without its locomotive (to make it resemble a multiple-unit electric train) and the ideal seven carriage train with flat ends, showed the advantage of the smooth exterior surfaces, faired chassis, and covered gaps of the latter. The total resistance of the ideal train varied from about 0·7 of the standard train resistance at 0° yaw, to less than 0·5 at 30° yaw despite the extra carriage. Fairing the ends of the standard train reduced its resistance by about 25 per cent. for all angles of yaw, and fairing the ends of the ideal train reduced its resistance to less than half.

The effect of gaps between carriages was investigated with conventional L.M.S. and L.N.E. trains, and also with the ideal train. Reducing the standard gap of 44 in. in the L.M.S. train to 20 in., and then to 6 in. led to reductions of 3·1 and 5·2 per cent. at 0° yaw and of 2·6 and 4·7 per cent. at 20° yaw in the total air resistance. Merely covering the gaps led to decreases of only 1·3 and 2·9 per cent. Little benefit was obtained from reducing the standard L.N.E. gap from 16 in. to 2 in. because the carriages of this train had rounded ends which still produced a break in the surface 24 in. long even with the gap reduced to 2 in.

The effect of leaving gaps of 44 in. between the carriages of the ideal train (while retaining front and end fairings) was to increase the resistance of the gapless train by 20·7 per cent. at 0° yaw, and by 158·0 per cent. at 20° yaw. The latter increase was large not only relatively but in actual pounds, being several times as great as the effect of gaps in conventional trains. It was thought that the skin of air carried along by the rough standard trains prevented gaps from having much influence, but that with a smooth train the air velocity over the surfaces was higher, so that when gaps were provided there was a direct impingement upon the partially unsheltered front ends of the carriages.

Experiments conducted to determine the separate contributions of body and chassis to the total air resistance of standard L.M.S. and L.N.E. carriages showed that the chassis contributed from about 50 to over 80 per cent. of the total, the larger figure corresponding to larger angles of yaw when the front bogie no longer sheltered the hind one. Fairing the chassis reduced the resistance of all carriages in the centre of the train by about 30 per cent. at 0° yaw, and by close on 50 per cent. at 30° yaw. The effect on the end carriages, while the same in absolute measure, was smaller expressed as a percentage because of the larger totals due to exposed front and rear surfaces.

Part III.—Deductions

Assuming a coal consumption of 3 lb. per b.h.p. hr., and a coal cost of £1 per ton, the savings to be effected by modifying the carriages in a six-coach train varied (at 100 m.p.h. in still air) from £0·246 to £0·48 an hour depending on the degree of modification. The saving was nearly but not quite proportional to the number of carriages, and greater economies were indicated if the locomotive also were streamlined. The full benefit of some of the modifications would not be obtained except with a side wind blowing, and therefore larger savings were to be expected under adverse running conditions. Instead of saving power and fuel, advantage could be taken of improvements to run at higher speeds.

Comparison was made between an L.M.S. train having a locomotive and different numbers of carriages with trains variously modified. In modification A there were only fairings on the engine, tender and last carriage. In modification B all carriages had smooth bodies and faired chassis. Finally there was the completely streamlined or ideal train. For these four varieties of train, each comprising a locomotive and 12 carriages, the horsepowers needed to overcome air resistance at 100 m.p.h. were 2,100, 1,715, 1,060 and 530 respectively. To show the relative importance of savings in air resistance the author plotted the resistance of a standard train as a percentage of the total resistance. This percentage with a 12 carriage train varied from about 10 at 20 m.p.h. to about 62 at 100 m.p.h. Thus at 80 m.ph. and over the air resistance formed the larger part of the total and warranted the attention which was being given to its reduction.

The effect of lateral air pressures was to increase the tractive resistance by about 1·45 lb. for every 100 lb. of sideways pressure. Of this 0·25 lb. was due to flange and wheel slip and 1·2 lb. to friction at the bearing bosses. Modifications in train form had little effect on the lateral pressure of the air, so that this item of tractive resistance was about the same for ideal and conventional trains.

The direction of the natural wind influenced the air resistance to produce in this a maximum when it blew from one side. With a standard six-coach L.M.S.R. train the natural wind produced the greatest resistance when it blew from a direction inclined at from 67° to 53° to the direction of motion of the train. The smaller figure corresponded to the more swiftly blowing wind. With the ideal streamlined train the worst angle varied from 55 down to less than 30°.

ABSTRACTS OF RECENT PATENTS

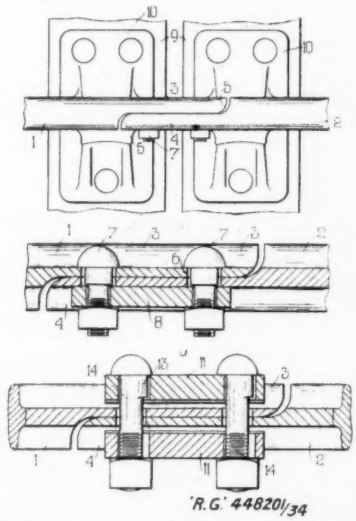
A correction

We much regret that on page 906 of last week's issue of THE RAILWAY GAZETTE (dated November 27) the compiler of our "Abstracts of Recent Patents," owing to a clerical error, wrongly attributed Specification No. 448,201 Improved Rail Joint to Sir W. G. Armstrong Whitworth & Co. Ltd. and Mr. George Pawson instead of to Mr. A. N. Brogden. We offer our apologies to all concerned for any inconvenience caused. The abstract in question should have read:—

No. 448,201. Improved Rail Joint

Alfred Nathan Brogden, of 413, *Lytham Road, Blackpool, in the County of Lancaster.* (*December* 11, 1935.)

In the improved rail joint, one of both ends of the rail lengths 1, 2 are of half width as shown at 3 and 4, and have their edges bevelled as at 5. These half widths are perforated with holes 6 of standard diameter, but elongated into somewhat elliptical shape, to allow of bolting together of the joints by means of bolts 7, but allowing for the expansion of the rails. Washer plates 8 are used as shown. It is essential to support the joint upon a pair of sleepers 9 and chairs 10, the rail ends being secured therein by wooden or metal keys. If desired the rail ends may be connected by means of fishplates cut into halves, thus affording a considerable saving, where these parts are already available. A standard fishplate is cut into two



pieces 11 and has the usual pear-shaped bolt holes 12, co-operating with snugs 13 on the standard bolt 14 to prevent rotation of these.—(*Accepted June* 4, 1936.)

MINISTRY OF TRANSPORT ACCIDENT REPORT

Near Micheldever, Southern Railway: August 15, 1936

At about 5.48 p.m., as the 4.58 p.m. Channel Islands boat train from Southampton was running at an estimated speed of 45 m.p.h. between Winchester and Micheldever, fire broke out, originating near the trailing end of the second passenger coach. Several communication cords were pulled and the train was immediately brought to a stand. Casualties were fortunately limited to eight minor injuries. A number of passengers had to alight hastily on both sides, but the driver of a down train, travelling at 75 m.p.h., seeing something amiss, made a full brake application and, whistling continuously, was able to slow to 40 m.p.h. when passing the burning coaches. The fire spread through the second and third passenger coaches with great rapidity, and ultimately, owing to difficulty in releasing brakes and couplings, another coach ahead and a Pullman in rear were involved, and all were completely destroyed down to the underframes; the other vehicles were undamaged. The four coaches were drawn into a siding at Micheldever, but the fire brigade was able, from lack of water, to protect only the Pullman gas cylinders, and the four bodies burnt themselves out. The line is on a steadily rising gradient of 1 in 250 from Eastleigh, for about 14 miles before the 59th milepost, where the train stopped. There is no station between Winchester and Micheldever, but there are two signal boxes, Wallers Ash East and Weston. The accident was inquired into by Colonel A. C. Trench.

The train was drawn by 4-6-0 engine No. 482 and was composed of the following ten bogie vehicles:—

Corridor Van No. 330	
Corridor First No. 7227	Totally Destroyed
Corridor First No. 7180*	
Corridor First No. 7169	
Pullman Car "Rainbow"	
Corridor Third No. 1899	
Corridor Third No. 808	
Corridor Third No. 1906	
Corridor Third No. 786	
Van No. 242	

* Fire started about trailing end of this coach

The train had been standing in the quayside platform shed for about an hour before departure, and the electric lights were switched on about 15 minutes before. The train examiner found nothing wrong.

Constructional and Electrical Details

The two coaches primarily concerned were built at Eastleigh in 1922, on heavy steel underframes, the body framing being teak and oak. The sides and ends were panelled externally with steel sheets and were lined internally with plywood and mahogany panelling. The roofing was deal, covered with canvas outside and panelled inside with asbestos millboard. There was a distance of about 3 in. between external and internal panels of sides and ends, and about 2 in. in the roof; small ventilation holes were provided to the spaces at the sides and ends. Flooring was Decolite composition on corrugated sheets. Since 1926 all new main line corridor stock on the Southern Railway has had Buckeye couplings and Pullman vestibule gangways. The latter will not fit the British Standard, and the faceplate and bellows of the standard connection have to be modified to enable them to be coupled to the Pullman vestibule.

The total length of gangway between coaches fitted with modified gangways is not increased above the British Standard, as this dimension is controlled by the buffers and couplings, but the length of two Pullman Vestibule gangways coupled by a Buckeye coupler is appreciably less.

The gangway between the trailing end of No. 7180 and the leading end of No. 7169 consisted of two modified British Standard connections. The upper portions of the canvas bellows were probably covered by canvas covers loosely strapped in position; in the company's latest practice, these covers are of smooth fireproofed leather; but it is impossible to determine for certain what kind was in use. In the British Standard gangway a sheet metal cover is provided; this is not practicable on the modified ones.

Electric light was supplied from a belt-driven dynamo, and two batteries below the underframe with automatic control charging and an automatic Pegoud change-over switch. Each battery consisted of 12 lead cells of 180 amp.-hr. capacity, working voltage 24 V. The positive leads were taken, through main fuses rated to blow at 125 amp.; in vulcanised indiarubber cables taped and braided, 7/·064 gauge, supported on cleats on the underside of the coach, to what was the leading end in both coaches, and brought up to a magnetic control switch, in a locked cupboard on the corridor end panelling; this control circuit could be coupled through to enable a guard to switch lights on and off in all coaches from one point, but was not connected up on this occasion. Adjacent to this switch was a two-way single pole iron clad fuse box, dividing the positive feed to the lamps into two circuits. One, the *general* lighting circuit, fed the centre lamps in the roof of each compartment, and the lamps in corridors and lavatories. The second, the *individual* lighting circuit, fed the lights over the seats, each with its local switch. The general circuit was switched on, but it is not certain whether the individual circuit was.

The loadings were (*a*) general, 13 lamps of 20 W., *i.e.*, a total load of 11 amp. at 24 V.; and (*b*) individual, 28 lamps of 20 W. *i.e.*, a total installed load of 23 amp. The fuses were tin lead alloy wires between screw terminals, the general circuit having one, rated to blow at 25 amp. and the individual circuit having two similar wires. On test this type of wire blew at 25 amp. after about $\frac{3}{4}$ min. No labels or identification marks in the fuse box showed the rating required, nor indicated which circuit was which. From these two fuses two main positive leads were taken up to the roof in V.I.R. cable, 7/·052 gauge, and along the centre for the length of the coach. The single negative main cable, 7/·064 gauge, was led up from the battery about the centre of the coach, and tee-jointed to a negative main of 7/·064 which ran alongside the two positive mains.

These three cables (two of 7/·052 positive and one of 7/·064 negative) lay together on the top of the canvas roof covering held in position by canvas straps at frequent intervals, nailed to the roof, protected from the weather by a strip of canvas. At points where a feed was taken to lamps below, branch cables, usually 3/·029 gauge, were teed off with a soldered joint, and led over the top surface of the roof under a similar canvas strip to where they led down to the lamp through a hole bored in the woodwork of the roof; in one or two holes examined on a similar coach, this had not been rounded off or countersunk to avoid sharp edges.

Each lamp on the individual circuit had a separate switch with fuse; this, of course, afforded protection against a short circuit in the lamp holder and lamp only.

The dynamos, Pegoud switches and charging switches were substantially undamaged and in working order; the main fuses (125 amp.) were intact, and Colonel Trench was assured that when the coaches were left in the siding at Micheldever, still burning, the batteries and battery cases were apparently not damaged. He was able to identify and examine almost all the tee joints in the main cables which had been lying along the roof; the majority were well made with ample contact area and good mechanical grip; it was impossible to see whether they had been properly soldered, as any solder had been melted, but on opening some joints of a similar coach selected at random, the joints were found well made and soldered and effectively taped. It is reasonable to assume that those in the burnt coaches were similar. One or two of the tee joints appeared poor, and in at least three cases the main cables had been spliced instead of being continuous; in two of these the portions of the stranded main cables were united by a few inches of thick solid copper wire.

The magnetic control switches were unworkable, but all terminals were tightly screwed down. The ironclad adjacent fuse boxes were undamaged and their cable socket connections ap-

peared in order, but all terminal nuts were loose, presumably due to melting of the fuse wires under them.

Possible Causes of the Fire

The signalmen at Wallers Ash (2½ miles) and Weston (1¼ miles) boxes watched the train pass and noticed no signs of fire. The evidence of passengers and the Pullman car staff, though conflicting, is sufficiently unanimous to show that the fire originated at about the rear of coach No. 7180, or front of No. 7169. A passenger was walking back and saw a spurt of flame, as though coming out of a hose, with thick smoke, as he was about opposite the rear compartment of coach No. 7180. The flame appeared to originate over the gangway about the centre of the roof.

Colonel Trench considered the following possible causes of the fire, viz., hot box; mischievous or malicious action; dropped cigarette or unextinguished match; hot cinder from the engine; and electrical short circuit. He concluded that the first three—certainly the first two—could not be the origin.

A hot cinder might have entered the coach, or lodged in the gangway canvas. With the loose canvas covers probably in use, there would be more chance of a cinder lodging in the bellows with the modified type of half gangway than with the standard one, distinctly more than with a Pullman gangway. The canvas of cover and bellows would burn freely in a strong draught. Engines commonly work hard up this 1 in 250 gradient, but the train was well within its regular loading. Both driver and fireman were confident it was steaming easily, with the fire in good condition. A passenger in the leading coach stated that while passing through a tunnel—which must have been Wallers Ash—he noticed a lot of burning ash fly past. Some may have alighted on the top of the gangway. With such a fire there might be little more than a whiff of smoke at first, not noticeable by signalmen amid the steam and smoke from the passing engine.

The fusing of the two lighting circuits was inadequate to protect the branch wires to individual lamps, for which the safe current is 5 amp. The evidence clearly eliminates the magnetic control switch on coach No. 7180, and is sufficient to eliminate the one on No. 7169. The circuit was disconnected. A short circuit or low resistance leak might sufficiently overload the 3/·029 V.I.R.-cables leading to the corridor lampholder, without blowing their fuse, and initiate a fire between the soft wood roof and the asbestos millboard ceiling, but there is no definite explanation of the cause of such a short circuit. There are obvious possibilities of leakage overload over a prolonged period with resultant heating, culminating in sudden short circuit. A test on similar leads with a steady 15 amp. for ¾ hr. made wires and lampholders very hot. The branch leads on the coach roof were covered by a strip of canvas only and had no real protection against mechanical damage. The electrical installation is subjected to a thorough examination during periodical shop overhauls, the last being on March 3, 1936 (coach No. 7180), and December 27, 1935 (coach No. 7169). A fortnightly superficial examination on August 13 had revealed no defects.

Recommendations and Remarks

It is not possible to ascertain with certainty which alternative—spark or cinder, or short circuit—was responsible for the fire, but Colonel Trench considers that the evidence, so far as it is reliable on detail, points to the second; but a spark from the engine must be recognised as equally probable.

This case has brought to notice certain points which should have careful consideration:—

1. The top canvas of gangway bellows is obviously particularly liable to catch and retain falling sparks and ashes. The British Standard gangway can be largely protected by a sheet metal cover, and the Pullman gangway with Buckeye coupling is much shorter and less liable to this risk. In the case of the modified gangway, a necessary inconvenience during a transition period from standard to Pullman type, protection is not so easy. Colonel Trench does not think that loose canvas covers, which were probably in use, are satisfactory. Their replacement by a smooth and closely fitting cover of some more fireproof material is a matter which should be dealt with at an early date. The company has been unable to obtain a canvas which would remain really fireproof; the leather covers now being installed appear to offer more prospect of being at any rate fire-resisting, if not absolutely fireproof.

2. The design and layout of the electrical installation on the coaches in question involves certain unnecessary, though possibly remote, risks, and should be modified when opportunity offers. The present practice of the company is quite different, and these criticisms are based on the methods adopted on the 53 coaches concerned, built in 1922.

The risks of a 24-V. installation, supplied by batteries of high capacity, are really greater, owing to the heavier currents which have to be dealt with, than with an ordinary domestic 230-V. installation.

It appears that the following points were not given due weight in the wiring adopted:—

(*a*) Circuits should be so arranged and fused that any part can carry with reasonable safety current up to that which will blow its protecting fuse.

(*b*) Fuse sockets or terminals should be marked with the rating of the relative fuse. In new construction it would be distinctly preferable that a coach of this type should have at least three circuits, each fused at 25 amp., rather than one circuit at 25 amp. and one at 50 amp.

(*c*) Cables and leads should be adequately protected against mechanical damage.

There are obvious difficulties about the use of the "looping in" system with this low voltage and its heavy cables, but with the present system of soldered tee joints it is of the greatest importance to make certain of reliable workmanship in the jointing, insulation, and installation of cables. The number of such joints should be reduced to a minimum.

Colonel Trench considers the question of all-steel stock not to have much practical connection with this case; risk of fire is not serious enough on steam hauled stock on surface railways to justify elimination of wood panelling, &c.; the weak point of these coaches was the soft wood roof. A steel roof deserves consideration for future construction, or fire-resisting treated timber.

Women's Place in Business

Mr. A. S. Quartermaine, G.W.R. Assistant Chief Engineer, presided over a meeting of the G.W.R. Lecture and Debating Society at Paddington station on November 19, when Mrs. Betty Gardner, of Swindon, gave a paper on "Women's place in business. Should it be extended or curtailed?" The attendance was notable for the presence of a large number of women members of the staff.

The speaker made reference to the factor of sex antagonism, manifested by a striving on the part of man to keep woman in an inferior position (which generally speaking he believed to be her proper place) and woman's efforts towards obtaining recognition of a position of equality. Mrs. Gardner traced the development of women's position and prestige outside of domestic life and spoke of the impetus in this matter that was given by the great war.

Women had always been paid less than men, and in discussing the question of equal pay for equal work the speaker had regard to the fact that men generally had heavier economic burdens to carry, and that they were more dependable in respect of continuity of employment, and had greater stamina. In any case, if equal pay for equal work were established very few women would obtain any industrial or commercial work at all.

In the spheres for which they were best fitted, such as nursing, school teaching, saleswomen, and shorthand-typists, and in the lighter industries where they were deft and skilful, women could ill be spared. In some of the professions, too, they were rapidly making good and were worthy of greater representation.

The difference in outlook between boy and girl entrants into business was commented upon—the boy knowing he was in a job for life, while the girl was seldom unmindful of matrimonial possibilities. Figures showed that the employment of women in relation to men on the railways had more than doubled since the war, but the proportion was still small, being less than 3.5 per cent. on the Great Western Railway.

Among conclusions drawn by the lecturer were that women should be prohibited from engaging in work which entailed too great a physical strain upon them; married women should not be expected to provide financial support for their children in addition to the full time job of rearing and caring for them; and that more schemes should be initiated for pensions for middle-aged women.

XUM

QUESTIONS IN PARLIAMENT

Level Crossings and Toll Bridges

Lieutenant-Commander Tufnell, on November 19, asked the Minister of Transport what was the number and situation of level crossings on the roads which he was taking over in the Trunk Roads Bill and whether he would give an undertaking to take steps to do away with these crossings at the earliest opportunity after he obtains the necessary powers.

Captain Plugge asked the Minister of Transport how many level crossings and toll bridges were situated on the trunk roads which he proposed to take over; and whether he could give an undertaking that these would be eliminated by 1940.

Captain Hudson (Parliamentary Secretary Ministry of Transport).—I understand that there are three toll bridges and one toll ferry on roads described in the schedule of the Trunk Roads Bill. I have not yet obtained a return of the number of level crossings, but if the Bill becomes law the Minister will certainly devote attention to the relative need of improvements of all kinds.

A Bridlington Accident

Lieutenant-Colonel Sir Mervyn Manningham-Buller, on November 23, asked the Minister of Transport whether his attention had been called to the fatal accidents to motorists on a railway level crossing near Bridlington on November 15 and whether he would take steps to have such level crossings which were not operated or controlled by signalmen bridged.

Captain Hudson.—An enquiry into the circumstances of this accident is being held today by one of the officers of the Ministry and the Minister is awaiting the report of the enquiry.

East End Facilities

Mr. Goldie on November 24 asked the Minister of Transport whether his attention had been drawn to the fact that no fewer than 12,000 westward-bound passengers were conveyed at 9 a.m. daily to Whitechapel station, whilst seating accommodation was provided for only 4,000 passengers; and whether, in the interests of public safety and the convenience of the travelling public, he would take steps to reduce the ratio of standing to seated passengers, and to ensure that additional seating accommodation was provided during rush hours for such passengers as were now compelled to stand.

Mr. Hore-Belisha.—It was the purpose of the Treasury guarantee of £40 millions for railway works in and around London to accelerate a programme of urgently needed improvements. These include the rebuilding of Aldgate East station, which will enable Metropolitan Line trains to and from Barking to be increased from six to eight cars, and thus increase the seating capacity of the service.

Railways in East Africa

Mr. Day on November 25 asked the Secretary of State for the Colonies whether he would state the total length of railway lines that had been constructed in the British dependencies in East Africa during the five years ended December 31, 1935; the manner in which this construction had been financed; and whether any grants or loans for same had been made by the Imperial Government.

Mr. Ormsby Gore.—As the answer is in the form of a tabulated statement I will circulate it. The following is the statement:—

Railway Construction in East Africa, 1931–35

Railway	Method of Financing	Grants or loans from Imperial Funds
Kenya and Uganda Railway. Yala–Butere extension (10·75 miles).	Loan funds raised by Kenya Government on behalf of the Kenya & Uganda Railway.	None.
Tanganyika. Branch railway from Manyoni to Kinyangiri (93·58 miles).	Loan funds raised by Tanganyika Government.	Free grant of £30,000 from the Colonial Development Fund to cover interest charges for two years.
Nyasaland. Railway from Blantyre to Salima (160 miles).	Sums advanced to Nyasaland Railways Limited by Nyasaland Government from Nyasaland Loan Funds.	A grant of £500,000 was made from the Colonial Development Fund to meet interest charges on Nyasaland Guaranteed loans for a period of years.

Total length of lines constructed: 264 miles.

Needs of South London

Mr. Silkin on November 25 asked the Minister of Transport whether he was aware of the serious difficulties and hardship caused to residents of Southwark and Camberwell in getting to and from their work owing to inadequate means of transport; whether his attention had been drawn to a reply made recently by the Chairman of the London Passenger Transport Board to a deputation from Southwark and Camberwell to the effect that no action could be taken by the board to deal with the problem; and whether, in the circumstances, he was prepared to take any and, if so, what action in the matter.

Mr. Hore-Belisha.—I am informed by the Chairman of the board that the views expressed by the deputation to which the hon. member refers are being placed before the Standing Joint Committee set up under the London Transport Act, 1933.

Ladies' Compartments

Mr. Day on November 25 asked the Minister of Transport whether he would consider making representations to the various railway companies of Great Britain asking them to have one or more compartments set aside and labelled for ladies only on all main-line trains.

Mr. Hore-Belisha.—This, I am informed, is the practice.

Locomotive Headlights

Mr. Leckie on December 1 asked the Minister of Transport whether he had now received a report on the experiments carried out by the L.N.E.R. in connection with the use of headlights on railway engines; whether they had been successful and, if so, whether he would recommend their general adoption on the railway systems in the interest of public safety.

Captain Hudson.—The company inform me that this experiment of using special signals fitted with reflectors, which are detected by electric headlamps of comparatively low power, is working satisfactorily on the Boroughbridge branch line; but it is not a system suitable for general adoption.

Railway Smoke in Liverpool

Mr. Kirby asked the Minister of Health, whether he would use his influence to effect agreement between the health committee of Liverpool and the L.M.S.R. as to the methods whereby the company might be able to assist in the early abatement of the smoke nuisance in the central area of Liverpool.

Sir Kingsley Wood.—I am informed that the railway company are obtaining a report on existing conditions as a preliminary step to considering what practicable measures can be taken in co-operation with the Town Council in the matter. I do not feel that anything would be gained by my intervention at the present stage. I am, however, keeping in touch with developments.

A Denaby Main Crossing

Mr. Thomas Williams on December 2 asked the Minister of Transport if he was aware of the inconvenience and dislocation of traffic which were caused by the railway crossing at Denaby Main; whether any scheme was under consideration for the erection of a bridge; and, if so, would his department make a substantial grant towards the cost.

Mr. Hore-Belisha.—The five-year programme of the West Riding County Council includes provision for a new bridge to replace the level crossing at an estimated cost of £150,000. The Council has not yet submitted details, but I shall be prepared to consider an application for a 75 per cent. grant to an approved scheme.

The Road and Rail Transport Problem

On Wednesday evening Mr. A. J. Pearson, of the L.M.S.R., addressed the Kynoch Shop Management Association (Imperial Chemical Industries), on the subject of the road and rail transport problem, with especial regard to the classification of railway charges. Much of the ground covered was familiar to railwaymen, although not always fully understood by those not directly engaged in the industry, and, in addition, Mr. Pearson raised a number of points of special interest.

For example, it is not always remembered that, at the time of grouping, when opportunity was taken to effect a complete revision of railway rates and charges, the trading associations supported the classification principle. Revision was begun in 1920 and not completed until 1927, and many of the principles which had applied to the railways before the war were found to be required after hostilities had ceased, despite the advent of modern highways and the internal combustion engine.

In 1920 the various trading interests were asked by the Minister of Transport for their views on the general principles that should be embodied in the new Act as the future basis of rates and charges, and Mr. Pearson quoted examples of the replies that were sent. The Mining Association was of opinion that the then existing system, taken as a whole, met the needs of the commercial community; the Mansion House Association, the Federation of British Industries, and the Central and Associated Chambers of Agriculture thought that the existing system of rates and charges should be continued. With these replies, and after a statutory advisory committee appointed by the Minister of Transport (who was then in possession of the railways) had held a public inquiry to determine what modifications were necessary, Part III of the Railways Act of 1921 was framed, and was still in force.

This charging structure had five main principles. In the first place there was a comprehensive classification of all merchandise based largely on the value of the commodities conveyed—although other factors were important; secondly, a system of rates and charges was based on this classification; thirdly, a standard revenue was fixed which the charges should aim at earning; fourthly, undue preference was forbidden and rates were required to be published; and lastly provision was made for appeals to the Courts in regard to the reasonableness of charges or against proposed increases.

After pointing out that one of the main provisions—the standard revenue arrangements—had not yet functioned at all, partly, he said, by reason of the growth of road transport and partly because of acute trade depression and international complications, Mr. Pearson stressed the importance to the community of the railway as a comprehensive system. The problem of rates and charges was the problem of how to raise a revenue which would enable the railway industry to be carried on and developed upon a commercial basis.

Classification of merchandise based mainly on the value of the commodities had applied as an integral factor of a classified charging system ever since canals, docks, and railways began to serve the community. In 1929 the Royal Commission on Transport heard the evidence of the Federation of British Industries, the Mansion House Association, and the Traders' Traffic Conference. The F.B.I. embraced more than 20,000 industrial undertakings and covered every representative production trade in the United Kingdom, while the Mansion House Association was composed of some thousand firms who were all large traffic users. The representatives of these bodies informed the Royal Commission: "It is considered that the scale of charges by railway based on classification of goods is the right method of charging railway rates." The Royal Commission gave the opinion in its final report published in 1931 that the system of classification of merchandise and railway rates was "working satisfactorily."

The growth of competition by road transport, which was not required by Parliament to apply the theory of value in fixing charges, had naturally jeopardised the whole plan, said Mr. Pearson, because it had automatically attracted to it traffic of high classification and had also depressed rates. The result was that the railway system was shorn of an important proportion of its formerly remunerative traffic but was left with all the obligations of a publicly controlled carrier with a comprehensive classified scale of charges to carry a vast and expensive volume of miscellaneous business in packages too small, or between points too scattered, or of too low grade a type, to be attractive to its competitors. Whether a new basis of rail charges was desired or not, the existing dissimilarity in the methods of freight charging by road and rail was gradually bringing the situation to the critical point, and a collapse of the system of rail charges might cause vast disturbances of trade, with repercussions which it was difficult to forecast. It was necessary that traders, and indeed the community, should understand the position so that steps could be taken to avoid such a contingency.

The road goods transport industry was in small units, chiefly one-man businesses. In most cases there had been no regular scheme of rates, and until lately anybody could get a vehicle licence and operate as a carrier for hire. A great deal of the traffic had been obtained by simply undercutting the published rail rates, and the very size of the railway, its ramifications, and its need to apply equal conditions, had probably been an advantage to those who could quote rates as they wished from hour to hour and from place to place. The control imposed by Parliament in 1933 had naturally caused a little restraint on this. Burke's classic dictum might be adapted to the road goods industry that to regulate and to please, no more than to love and be wise, was not given to men. To bring an industry with several hundred thousand units and with no semblance of organisation up to the level of a uniform public service could not be accomplished without disturbance and possibly hardship.

The question of compensation to displaced hauliers was discussed during the passage of the Road and Rail Traffic Bill through the House of Lords. An endeavour was made to insert a clause providing for the payment of compensation in the event of refusal of a licence, or the imposition of new conditions which would reduce the value of an operator's business, owing to an objection being lodged. The amendment was negatived, and the Government's spokesman (the Earl of Plymouth) said: "The position now is that there is unlimited competition, particularly among small operators, so far as goods traffic is concerned, and they are continually being driven off the road. They get no compensation for that, and I, personally, venture to say, with a great deal of confidence, that these small operators in particular will get very much better treatment under this Bill than they could possibly hope for if the Bill were not passed into law."

Mr. Pearson emphasised that the railway companies had no wish to see the cessation of road transport. The four groups had important interests in the road passenger business, and had also invested some £4,000,000 in the road goods business apart from their own cartage equipment comprising 9,000 parcels and goods motor vehicles, and 5,000 trailers. The total number of road motor vehicles operated by the railway companies and their associated road concerns now amounted to 11,641 vehicles and 5,601 trailers. There were also about 26,000 railway-owned horse vehicles. Road transport interests often pointed to railway methods of organisation as a model of efficiency and exhorted their members to copy them, but in the next breath condemned the railway out of hand as a vehicle of service! One would think that a transport undertaking with so ideal an organisation and with so much experience behind it would have *some* balance in its public relations.

Forthcoming Meetings

Dec. 8 (*Tues.*)—**Assam-Bengal Railway Co., Ltd.** (Ordinary General), 56, Victoria Street, S.W.1, at 12 noon.

NOTES AND NEWS

New Electric Services, Southern Railway.—From last Monday, November 30, a number of the steam trains on the Weybridge to Virginia Water line were superseded by electric trains. These trains run every weekday, beginning with the 11.41 a.m. Virginia Water to Weybridge, and thus form the first portion of the new electrification extensions.

L.M.S.R. Engine Named "The Old Contemptible."—The L.M.S.R. engine No. 6127 was on November 28 named *The Old Contemptible*, in a ceremony at Euston station. The naming was performed by General Sir Felix Ready, President of the Old Contemptibles' Association, 250 members of which were present. The L.M.S.R. was represented by Mr. W. V. Wood, a Vice-President of the company.

Canadian Pacific Earnings.—Gross earnings of the Canadian Pacific Railway for the month of October, 1936, amounted to $14,249,000, an increase of $51,000 in comparison with October, 1935. In the working expenses of $9,846,000 there was a reduction of $103,000, leaving net earnings $154,000 higher, at $4,403,000. Aggregate gross earnings for the first ten months of 1936 were $114,193,000, an increase of $7,954,000, and the net earnings of $16,230,000 were higher by $594,000.

Canadian National Earnings.—For the month of October, 1936, gross earnings of the Canadian National Railways amounted to $18,786,278, an increase of $962,440 over October, 1935. Operating expenses ($15,147,759) advanced by $951,986, to leave net earnings of $3,639,519, which were $10,454 higher than for October, 1935. Aggregate gross earnings from January 1 to October 31, 1936, were $153,234,590, an improvement of $10,311,676, and the net earnings for the 10 months were $81,355 higher, at $9,843,980.

Restaurant Car and Retiming on Southern Train Ferry Service.—As from last Monday a Pullman restaurant car has been attached to the through London–Paris sleeping car train between Victoria and Dover Marine. The outward service leaves Victoria at 10 p.m., and suppers and light refreshments are served from 9.15 p.m. On the return, breakfast is served from the time the car is attached to the train at Dover Marine. From December 1 this service has been retimed to reach Victoria at 9.5 a.m.

Freight Rebates Scheme Review.—The Railway Rates Tribunal has issued its formal judgment, continuing the rates of rebates on selected traffics under the freight rebates scheme for the year ending September 30, 1937, on the same scale as those prevailing for the two previous years, namely, 15 per cent. of carriage charges for agricultural, 27½ per cent. for coal, etc., 32½ per cent. for coal tolls, and 12½ per cent. for other traffics. The sums paid in rebates for the previous year were £758,046 agricultural, £2,459,547 coal class, and £389,340 other industrial.

Railway Freight Rebates Bill.—This Bill, which was read a second time in the House of Lords on November 24, passed through the Committee stage and was reported without amendment on November 26. At the third reading stage on December 1 amendments were made, and the Bill was passed and sent to the House of Commons, which gave it a first reading on the same day. The Bill was listed for second reading yesterday, but notices of objection have been lodged by three members.

Renewal of R.A.S. Air Mail Contract.—It is announced that Railway Air Services Limited has been awarded for the second year in succession the contract for the carriage of mails on Britain's principal internal air route, from London to Glasgow via Liverpool and Belfast. This route, which has been operated without cessation since 1934, provides a service which has enabled the postal authorities to effect a considerable reduction of time in the transit of mails. The passenger traffic over the route, moreover, shows a progressive increase.

Railway Rates Tribunal.—As will be seen from the legal notice on page 961, the Railway Rates Tribunal will sit on Tuesdays, January 19, February 16, March 16, April 13, May 11, June 15, July 13, October 19, November 16, and December 14, 1937, to hear applications as to the granting of new, or the reduction of existing, exceptional rates. The Court will also sit on Tuesdays, January 26, April 20, July 20, and October 26, 1937, to hear applications to determine any questions as to classification of merchandise; applications as to the reductions to be made from the standard charges where damageable merchandise is carried under owner's risk conditions; and applications as to rebates under the Railway Freight Rebates Scheme.

Railway Tickets as Christmas Gifts.—Following the successful introduction experimentally last year of a Christmas gift ticket scheme, the British railways are this year arranging a simple scheme to enable the public to buy and send railway tickets as gifts to their relatives and friends during the Christmas and New Year season. The scheme applies to all descriptions of railway tickets which are available for use on the outward journeys from December 5, 1936, to January 2, 1937, inclusive. Arrangements have been made for the railway companies to supply in advance of the holidays travel tickets for journeys beginning at any station. Greeting cards slotted inside to hold railway tickets are being produced, and these, with the appropriate tickets, will be despatched as gifts to friends, or forwarded to the address of applicants, as may be desired. Application folders will be available at railway stations and enquiry offices from December 5, or the tickets and greeting cards may be obtained by direct application by letter with remittance to eight central addresses: the Superintendent of the Line, G.W.R., Paddington station, W.2; the Chief Commercial Manager, L.M.S.R., Euston House, N.W.1; the Passenger Manager, L.N.E.R., Liverpool Street station, E.C.2.; the Traffic Manager, Southern Railway, London Bridge station, S.E.1; the Passenger Manager, L.N.E.R., York; the Commercial Manager, L.M.S.R., Central station, Glasgow; the Passenger Manager, L.N.E.R., Waverley station, Edinburgh; and the Traffic Superintendent, L.N.E.R., Aberdeen.

Road Accidents.—The Ministry of Transport return for the week ended November 28 of persons killed or injured in road accidents is as follows. The figures in brackets are those for the corresponding period of last year:—

	Killed, including deaths resulting from previous accidents		Injured	
England ..	105	(136)	3,171	(3,951)
Wales	5	(4)	137	(172)
Scotland ..	15	(6)	334	(332)
	125	(146)	3,642	(4,455)

The total fatalities for the previous week were 152, compared with 164 for the corresponding period of last year.

Forthcoming Events

Dec. 5 (*Sat.*).—Stephenson Locomotive Society (Midlands), at 4, Bury Old Road, Manchester, 6.30 p.m. Ten-Minute Papers.

Dec. 8 (*Tues.*).—Institute of Transport (Birmingham), at Queen's Hotel, 6 p.m. "First Principles of Passenger and Freight Train Operation," by Mr. W. Shelton.

Institute of Transport (London), at Inst. of Electrical Engineers, Savoy Place, W.C.2, 6 p.m. "Maritime Passenger Stations," by Dr. B. Cunningham.

Institute of Transport (Nottingham Graduate), at Guildhall, 7 p.m. "Transport Restrictions and their Effect on Industry," by Mr. A. Riley.

Institution of Civil Engineers, Great George Street, London, S.W.1, 6 p.m. "The Maintenance of Waterways to Harbours and Docks," by Mr. R. Carpmael.

Permanent Way Institution (Sheffield), at Royal Victoria Hotel, 7 p.m. "Permanent Way Foundations," by Mr. J. Dawson.

Dec. 9 (*Wed.*).—British Railway Stockholders' Union Limited, at Caxton Hall, Caxton Street, London, S.W.1, 11.30 a.m. Annual General Meeting.

Institute of Welding (London), at Inst. of Mechanical Engineers, Storey's Gate, S.W.1, 6.30 p.m. "The Weldability of Steel," by Dr. T. Swinden.

Institute of Welding (Scottish), at Royal Philosophical Inst., 207, Bath Street, Glasgow, 7.30 p.m. "Electrode Manipulation," by Mr. J. Carpenter.

Permanent Way Institution (Newcastle), at Mining Inst., Westgate Road, 7 p.m. "Winning Coal and its Effect upon the Railways," by Mr. G. Davison.

Dec. 10 (*Thurs.*).—G.W.R. (London) Lecture and Debating Society, in General Meeting Room, Paddington Station, W.2, 5.45 p.m. "Interesting Aspects of the South Wales Coal Trade," by Mr. E. Evans.

Institute of Welding (Liverpool), at City Technical College, Byrom Street, 7.30 p.m. "Oxy-Acetylene Welding and Cutting as Applied to Track Work," by Mr. N. Swinnerton.

Southern Railway (London) Lecture and Debating Society, at Chapter House, St. Thomas's Street, S.E.1, 5.45 p.m. "Operating Problems in Connection with Special Events," by Mr. J. Sharpe.

Railway Bills in Parliament

Each of the four main line railway companies is giving notice of a Bill in Parliament for the Session of 1937, and the London Midland & Scottish is also promoting a Scottish Provisional Order. London Transport also has a Bill. The Great Western Bill will include three new railways. The first (2 miles 7 furlongs in length) will connect Denham with the Ealing & Shepherd's Bush Railway Extension authorised by the Great Western Company's Act of 1936. Railway No. 2 (7 miles 3 furlongs in length) will be a variation from the deviation near Dawlish which was sanctioned by the company's Additional Powers Act of 1936. A short connection between Pyle station and the Porthcawl branch will form Railway No. 3. Abandonment is proposed of Railway No. 3 authorised by the Llantrissant & Taff Vale Junction Railway Act, 1866, and of portions of the following railways: Camerton branch; Brecon & Merthyr Railway; Pont Shon Norton branch; Llancaiach branch; Mwyndy branch; Llantrisant Common branch; Treferig Valley; Ely Valley branch; and Mountain branch.

Construction of a railway of 6 furlongs at Eynsford and of a bridge widening at Dorking are proposed in the Southern Railway Bill, which will also provide for an extension of time for completion of the jetty and graving dock (No. 2) authorised by the Act of 1927, and for compulsory purchase of lands required for the subway authorised in 1931 at the City station of the Waterloo & City Railway, and for the Folkestone-Dover deviation authorised in 1934. Power is being sought to close the opening span of the bridge over the Arun at Ford, and to remove the boundary wall in Buckingham Palace Road between Elizabeth bridge and Ebury bridge. The London Passenger Transport Board Bill will propose an extension of the Morden-Edgware tube 2¼ miles towards Elstree. Extension of time for completion of works is sought in the L.M.S.R. Scottish Order.

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 48th Week			Totals to Date		
	1936	1935	Inc. or Dec.	1936	1935	Inc. or Dec.
	£	£	£	£	£	£
L.M.S.R. (6,916¼ mls.)						
Passenger-train traffic...	393,000	382,000	+ 11,000	23,822,000	23,223,000	+ 599,000
Merchandise, &c. ...	498,000	491,000	+ 7,000	23,031,000	21,775,000	+ 1,256,000
Coal and coke ...	273,000	294,000	− 21,000	11,522,000	11,163,000	+ 359,000
Goods-train traffic ...	771,000	785,000	− 14,000	34,553,000	32,938,000	+ 1,615,000
Total receipts	1,164,000	1,167,000	− 3,000	58,375,000	56,161,000	+ 2,214,000
L.N.E.R. (6,332 mls.)						
Passenger-train traffic...	262,000	265,000	− 3,000	15,509,000	15,193,000	+ 316,000
Merchandise, &c. ...	372,000	389,000	− 17,000	15,706,000	15,219,000	+ 487,000
Coal and coke ...	258,000	277,000	− 19,000	11,159,000	10,773,000	+ 386,000
Goods-train traffic ...	630,000	666,000	− 36,000	26,865,000	25,992,000	+ 873,000
Total receipts	892,000	931,000	− 39,000	42,374,000	41,185,000	+ 1,189,000
G.W.R. (3,746½ mls.)						
Passenger-train traffic...	172,000	162,000	+ 10,000	10,051,000	9,844,000	+ 207,000
Merchandise, &c. ...	201,000	196,000	+ 5,000	9,195,000	8,822,000	+ 373,000
Coal and coke ...	112,000	125,000	− 13,000	4,829,000	4,807,000	+ 22,000
Goods-train traffic ...	313,000	321,000	− 8,000	14,024,000	13,629,000	+ 395,000
Total receipts	485,000	483,000	+ 2,000	24,075,000	23,473,000	+ 602,000
S.R. (2,153 mls.)						
Passenger-train traffic...	254,000	246,000	+ 8,000	14,750,000	14,447,000	+ 303,000
Merchandise, &c. ...	67,500	70,500	− 3,000	3,023,500	2,977,500	+ 46,000
Coal and coke ...	34,500	44,500	− 10,000	1,476,500	1,448,500	+ 28,000
Goods-train traffic ...	102,000	115,000	− 13,000	4,500,000	4,426,000	+ 74,000
Total receipts	356,000	361,000	− 5,000	19,250,000	18,873,000	+ 377,000
Liverpool Overhead ... (6½ mls.)	1,136	1,097	+ 39	57,326	56,531	+ 795
Mersey (4½ mls.) ...	4,720	4,165	+ 555	196,290	192,587	+ 3,703
*London Passenger Transport Board ...	553,300	544,400	+ 8,900	12,332,600	11,967,200	+ 365,400
IRELAND.						
Belfast & C.D. pass. (80 mls.)	1,734	1,777	− 43	122,431	121,409	+ 1,022
,, ,, goods	569	517	+ 52	25,743	24,525	+ 1,218
,, ,, total	2,303	2,294	+ 9	148,174	145,934	+ 2,240
†Great Northern pass. (543 mls.)	8,250	7,750	+ 500	513,700	492,450	+ 21,250
,, ,, goods	11,100	10,900	+ 200	456,250	453,500	+ 2,750
,, ,, total	19,350	18,650	+ 700	969,950	945,950	+ 24,000
†Great Southern pass. (2,067 mls.)	26,550	26,210	+ 340	1,702,453	1,648,975	+ 53,478
,, ,, goods	60,128	56,132	+ 3,996	2,043,244	1,913,278	+ 129,966
,, ,, total	86,678	82,342	+ 4,336	3,745,697	3,562,253	+ 183,444

* 22nd week. † 47th week.

British and Irish Railways Stocks and Shares

Stocks	Highest 1935	Lowest 1935	Prices Dec. 2, 1936	Prices Rise/Fall
G.W.R.				
Cons. Ord. ...	55½	44½	61½	+1½
5% Con. Prefce ...	124	108	125½	—
5% Red.Pref.(1950)	117	106¾	110½	—
4% Deb.	118½	108	115	—
4¼% Deb. ...	122	110	119½	—
4½% Deb. ...	129½	118	127½	—
5% Deb.	140¼	130	138½	—
2½% Deb. ...	82¼	68½	76½	—
5% Rt. Charge ...	137	128	135½	—
5% Cons. Guar. ...	136¾	120½	133½	—
L.M.S.R.				
Ord.	25 5/16	16	32	−½
4% Prefce. (1923)	58¼	43½	82	+½
4% Prefce. ...	87½	73½	92	—
5% Red.Pref.(1955)	107	97¾	107*	−1½
4% Deb.	110¼	99½	108½*	−1½
5% Red.Deb.(1952)	119 11/16	111 5/16	116½	—
4% Guar. ...	105 5/8	95½	105	−½
L.N.E.R.				
5% Pref. Ord. ...	15 7/8	8¼	11½	−½
Def. Ord. ...	7 9/16	4¾	5 7/8	−⅛
4% First Prefce.	74¾	48	78½	+½
4% Second Prefce.	31¾	16¼	28½	−½
5% Red.Pref.(1955)	92¼	71	99	—
4% First Guar. ...	103 11/16	93	102½	—
4% Second Guar.	98¾	82½	98½	—
3% Deb.	86	75	84*	−1
4% Deb.	109¼	98½	107*	−1½
5% Red.Deb.(1947)	118¼	106½	112½	—
4½% Sinking Fund Red. Deb.	112½	108	109*	−1½
SOUTHERN				
Pref. Ord. ...	87½	69¾	95½	−1
Def. Ord. ...	25 15/16	16¾	25	−1
5% Prefce. ...	124	108¼	125½	—
5% Red.Pref.(1964)	117¾	109½	117½	—
5% Guar. Prefce.	136½	121½	133½	—
5% Red.Guar.Pref. (1957)	121¼	112½	117½	—
4% Deb.	116¾	107	112*	−1½
5% Deb.	138	130¼	136½*	−1
4% Red. Deb. 1962–67	115	106½	111½*	−1
BELFAST & C.D.				
Ord.	9	4	5 1/8	—
FORTH BRIDGE				
4% Deb.	111¼	104¼	105½	—
4% Guar. ...	109 7/8	104	105½	—
G. NORTHERN (IRELAND)				
Ord.	20	7	12	—
G. SOUTHERN (IRELAND)				
Ord.	57½	14½	60	+6
Prefce.	50	25¼	65	—
Guar.	88¾	51¼	97¼	+2¼
Deb.	86¼	70	99½	—
L.P.T.B.				
4½% "A" ...	130	119¾	125*	−1½
5% "A" ...	139¾	130	135½*	−2
4½% "T.F.A." ...	113¾	108	109*	−2
5% "B" ...	131½	122¾	127*	−2½
"C"	109½	91	96	−1
MERSEY				
Ord.	23⅛	9¼	38½	—
4% Perp. Deb. ...	100½	93½	101	—
3% Perp. Deb. ...	75½	67	76½	—
3% Perp. Prefce.	62	47¼	67½	—

* ex dividend.

XUM

CONTRACTS AND TENDERS

The Gloucester Carriage & Wagon Co. Ltd. has received an order from the Crown Agents for the Colonies for two third class coaches for service on the 4 ft. 8½ in.-gauge lines of the Palestine Railways and generally similar to the six which this firm already has under construction for the same railway.

Large Diesel Railcar Orders

The Drewry Car Co. Ltd. has received an order for 99 diesel power-bogie rail coaches for service on the Buenos Ayres Great Southern and Buenos Ayres Western Railways.

Chinese Railway Contract for Britain

An agreement involving the purchase of £900,000 worth of British railway material for equipping the new Nanking-Kanchow Railway was signed in Nanking on December 2 by Jardine Matheson & Co. and the Chinese Ministry of Railways, states Reuters. The transaction will be financed jointly by banking houses and the trustees of the British Boxer Indemnity.

Taylor Bros. & Co. Ltd. has received an order from the Leopoldina Railway for 230 steel disc wheels and 600 steel tyres for carriages and wagons.

Horseley Bridge & Thomas Piggott Limited has received an order from the Nyasaland Railways for two 4,500-gall. oil fuel tanks.

The Gregg Car Company has received orders from the Mysore State Railways Administration to the inspection of Messrs. Rendel, Palmer & Tritton, for 15 metre-gauge four-wheeled covered goods wagons, type IRS MOX, complete with wheels and axles; and five metre-gauge timber trucks complete with wheels and axles.

Heatly & Gresham Limited has received an order from the Indian Stores Department for 10 sets of lead acid cells, 250 amp.

The Chief Controller of Stores, Indian Stores Department, has placed orders with the General Electric Co., (India) Ltd., Callender's Cable & Construction Co. Ltd., and Saxby & Farmer (India) Limited, for the supply of quantities of primary cells and renewals.

Sir W. G. Armstrong, Whitworth & Co. (Engineers) Ltd. has received orders from the Indian Stores Department for three non-reversible corner drills, and one concentric holder-on.

The D.P. Battery Co. Ltd. has received important orders for locomotive batteries from the General Electric Co. Ltd., and the Metropolitan-Vickers Electrical Co. Ltd. The nine locomotives for which these batteries are ordered will be used by the London Passenger Transport Board in connection with extensions now in progress on the Underground railway system. The batteries are each of 768-a.h. capacity and 320 volts and comprise cells of the latest D.P. Kathanode Locomotive type. This order follows the successful use of three similar batteries on this work during the past five years.

British Locomotives Ordered for Colombia

Beyer, Peacock & Co. Ltd. has received an order from the Dorada Railway for two Beyer-Garratt articulated locomotives of the 4-6-2 + 2-6-4 wheel arrangement and for the 3-ft. gauge. These engines, which will develop a tractive effort estimated at 33,000 lb. at 85 per cent. boiler pressure, will have bar frames, and will include Nicholson Thermic syphons in their equipment. They will be fitted for oil firing and will have a maximum axle load of 10 tons.

The Chinese Government Purchasing Commission has placed the following orders for equipment required for the Canton-Hankow Railway, to be supplied to the inspection of Messrs. Fox & Mayo:

I.C.I. Metals Limited, copper ingots.
Hurst Nelson & Co. Ltd., 24 wagon bogie frames.
William Beardmore & Co. Ltd., 200 wagon axles.
Brown, Bayley's Steel Works Limited, 470 wagon tyres.
Joseph Walsh & Co. (Birmingham) Ltd., a quantity of steel boiler plates.
Henry Berry & Co. Ltd., three drop pit jacks on traversing trolleys.

The English Electric Co. Ltd., has received an order for 49 luxury coach bodies from the Birmingham & Midland Motor Omnibus Co. Ltd., which order is additional to that for 65 single-decked omnibus bodies at present under construction for the same company. These bodies for long-distance operation will be built to the design and requirements of Mr. L. G. Wyndham Shire, at the company's Dick Kerr works, Preston, and will be mounted on special chassis designed and manufactured by the Birmingham & Midland Motor Omnibus Co. Ltd.

Guest, Keen, Williams Limited has received an order from the Indian Stores Department for two electric level luffing three-ton cranes.

The Bikaner State Railways Administration has placed the following orders to the inspection of Messrs. Rendel, Palmer & Tritton:—

Tata Iron & Steel Co. Ltd., 786 tons of medium manganese rails and 2,776 fishplates.
Guest, Keen, Williams Limited, 4,950 steel sleeper-keys, 19,000 steel sleepers, and 16,330 fishbolts.
Darlington Railway Plant & Foundry Co. Ltd., 12 sets of 12-ft. switches.

The New York Central System is stated to have ordered 100 steam locomotives costing about $8,600,000 and divided equally between Lima Locomotive Works and the American Locomotive Co. Ltd. Orders have also been placed for 82,150 tons of steel rails.

Samuel Fox & Co. Ltd. has received an order from the Chinese Government Purchasing Commission, to the inspection of Messrs. Sandberg, for three tons of Dunic nickel steel required for the Canton-Hankow Railway.

The Chloride Electrical Co. Ltd. has received an order from the Indian Stores Department for seven sets of lead acid cells, 175 amps.

The Consolidated Pneumatic Tool Co. Ltd. has received an order from the Indian Stores Department for four pneumatic grinders with pistol gear.

Ingersoll Rand (India) Limited has received an order from the Indian Stores Department for two rivet bursters complete and two electrically-driven air compressors and spares.

The South Indian Railway Administration has placed orders, to the inspection of Messrs. Robert White & Partners, with Linley & Co. Ltd. for 12 tons of metal comprising lead sheets, lead yarn and zinc sheets; and with Accumulators of Woking Limited, for 1,080 groups of positive sections for train-lighting cells.

The Chief Controller of Stores, Indian Stores Department, New Delhi, has placed orders with Guest, Keen, Williams Limited, Burn & Co. Ltd., the Britannia Engineering Co. Ltd., Richardson & Cruddas, and Saxby & Famer (India) Limited, for quantities of signalling and interlocking materials.

Leyland Motors Limited has received orders from the L.M.S.R., Northern Counties Committee, for hydraulic twin-engined diesel traction units required for an 80-seater railcar to be built in the N.C.C. shops.

Leyland Motors Limited has received the following orders from railway and railway associated road transport operators:—Hants & Dorset Motor Services Limited, six oil-engined Titans; North Western Road Car Co. Ltd., 12 oil-engined Tigers; and South African Railways & Harbours Board, four Beaver Sixes.

Tenders are invited by the Egyptian State Railways Administration, receivable by the General Management, Cairo Station, by December 19, for the supply of 566 carriage and wagon tyres.

Tenders are invited by the Bengal & North-Western and the Rohilkund & Kumaon Railways, receivable by the Agent and Deputy Agent, respectively, at Gorakhpur and Izatnagar, by January 2, for the supply of miscellaneous stores and oils required during the period April 1, 1937, to March 31, 1938.

Tenders are invited by the Chief Controller of Stores, Indian Stores Department (Electrical Section), New Delhi, receivable by December 19, for the supply of two 40-ton electrically-operated overhead travelling cranes to work on the same track, suitable for a metre-gauge locomotive erecting shop and required for the Eastern Bengal Railway at Saidpur.

LEGAL AND OFFICIAL NOTICES

Railway Rates Tribunal

RAILWAYS ACT, 1921.
LOCAL GOVERNMENT ACT, 1929.

New Exceptional Rates.
Reduction of Exceptional Rates
Classification of Merchandise
Reductions for Owner's Risk
Railway Freight Rebates Scheme

NOTICE IS HEREBY GIVEN that the Court of the Railway Rates Tribunal will sit on the following dates :—

Tuesday, 19th January, 16th February, 16th March, 13th April, 11th May, 15th June, 13th July, 19th October, 16th November and 14th December, 1937, to hear :

Applications as to the granting of New or the reduction of existing Exceptional Rates for which the consent of the Tribunal is required,

and

Application to the Tribunal for New Exceptional Rates or for the reduction of Exceptional Rates.

NOTICE IS FURTHER GIVEN that the Court will sit on the following dates :—

Tuesday, 26th January, 20th April, 20th July and 26th October, 1937, to hear :

Applications to determine any questions as to the alteration of the Classification of Merchandise, or the alteration of the Classification of any article, or the Classification of any article not at the time classified, or any question as to the Class in which any article is classified.

Applications as to the Reductions to be made from the Standard Charges where Damageable Merchandise is carried under Owner's Risk Conditions,

and

Applications to determine any question as to whether any Rebate is or was allowable or as to the basis on which any Rebate should be or should have been calculated under the Railway Freight Rebates Scheme.

Printed copies of the Procedure to be followed in any of the above-mentioned Applications can be obtained from the Office of the Tribunal.

T. J. D. ATKINSON,
Registrar.

Railway Rates Tribunal,
Bush House,
Aldwych,
London, W.C.2.
1st December, 1936

London & North Eastern Railway

NOTICE IS HEREBY GIVEN that, for the purpose of preparing the warrants for Interest on the Company's 3 per cent. and 4 per cent. Debenture Stocks and 4½ per cent. Sinking Fund Debenture Stock for the half-year ending 31st December, 1936, the balances will be struck as at the close of business on 11th December, and Interest will be payable only to those Stockholders whose names are registered on that date.

Transfers of the above-mentioned Stocks should, therefore, be lodged with the Registrar of the Company at Hamilton Buildings, Liverpool Street Station, London, E.C.2, before 5 p.m. on 11th December.

By Order,
JAMES McLAREN,
Secretary.

Marylebone Station,
London, N.W.1.
1st December, 1936.

Central Argentine Railway Limited

NOTICE IS HEREBY GIVEN that the Transfer Books of the 4 per cent. Debenture Stock and the 3½ per cent. Central Debenture Stock of the Company will be closed from the 8th to the 19th December, both days inclusive, for the preparation of Warrants for interest for the half year ending 31st December, 1936.

RONALD LESLIE,
London Manager and Secretary.

3A, Coleman Street,
London, E.C.2.
2nd December, 1936.

The West of India Portuguese Guaranteed Railway Company Limited

THE Directors are prepared to receive Tenders for the supply of :—

FIVE 3-TON ELECTRIC LEVEL LUFFING WHARF CRANES.

Specifications may be obtained at the Company's offices on or after the 7th December, 1936; a charge of £1, which will not be returned, will be made for each copy.

Copies of drawings may be obtained at the offices of the Company's Consulting Engineers, Messrs. Robert White & Partners, 3, Victoria Street, Westminster, S.W.1.

Sealed Tenders addressed to the Chairman and Directors of the West of India Portuguese Guaranteed Railway Company Limited, marked "Tender for Wharf Cranes," should be delivered to the undersigned not later than 12 Noon on Friday, the 1st January, 1937.

The Directors do not bind themselves to accept the lowest or any Tender.

LEONARD G. BOURCHIER,
Secretary.

4, Coleman Street,
London, E.C.2.

RAILWAY AND OTHER REPORTS

Pullman Car Co. Ltd.—The directors recommend the payment of a dividend of 3 per cent. on the 7 per cent. cumulative preference shares on account of arrears. A payment of 2½ per cent. on account of preference arrears was made in January of this year.

Midland Railway Company of Western Australia.—The directors have authorised a final payment of interest on the second mortgage cumulative income debenture stock, on account of the year ending June 30, 1936, at the rate of 3 per cent., less income tax, at 4s. 9d. in the £1, payable January 1, 1937, making, with the interim payment of 2 per cent. on July 1, 1936, 5 per cent. for the year.

London Midland & Scottish Railway.—The directors, at their meeting on November 26, had under consideration the dividend on the 5 per cent. redeemable preference stock (1955), which ranks *pari passu* with the company's 4 per cent. preference stock, and decided that a final dividend of £2 10s. per cent. be paid, making with the interim dividend of £2 10s. per cent. £5 per cent. for the year. The warrants in respect of this dividend will be posted on December 31.

Proprietors of Hay's Wharf Limited.—The net profit for the year to June 30, 1936, including £28,782 rating reserve no longer required, is £244,824, comparing with £235,598 for the previous year. Adding £93,113 brought in gives a total available of £337,937. Of this amount the preference dividend takes £89,400, ordinary dividends (at 10 per cent.) £100,000, and appropriation to reserve £40,000, leaving £108,537 to be carried forward. For the previous year the dividends and the appropriation to reserve were the same as for the year under review.

Wellington, Grey & Bruce Railway.—The estimated earnings for the half year ending December 31, 1936, applicable to meet interest on the 7 per cent. bonds, will admit the payment of £4 2s. 6d. a £100 bond, and this payment will be applied as follows :—10s. 3d. in final discharge of coupon No. 108, due on July 1, 1924 ; £3 10s. on account of coupon No. 109, due January 1, 1925 ; and 2s. 3d. on account of coupon No. 110, due July 1, 1925. Payment will be made on January 1. Notice is also given that 57 of these 7 per cent. bonds (amounting in all to £5,700 sterling) have been drawn, and that interest thereon will cease after January 1 next.

Assam-Bengal Railway.—Gross receipts for the year to March 31, 1936, including those from worked lines, were Rs. 1,71,74,228, against Rs. 1,92,08,013, and the working expenses Rs. 1,46,01,067 compared with Rs. 1,42,69,939 in the previous year, so that the operating ratio has risen from 74·29 per cent. to 85·02 per cent., and net earnings have fallen from Rs. 49,38,074 to Rs. 25,73,161. On the company's own line the gross earnings amounted to Rs. 1,61,30,168, and the net earnings to Rs. 25,73,161, or 1·08 per cent. on the capital expenditure. There are no surplus profits, and the directors propose to carry forward the sum of £1,845. The total open mileage of the system is 1,306½ miles, the same as in the previous year.

Exports of Railway Material from the U.K. in October

	Oct., 1936	Oct., 1935	Ten Months Ending Oct., 1936	Ten Months Ending Oct., 1935
	£	£	£	£
Locomotives, rail	41,617	81,436	1,095,615	609,040
Carriages and wagons	106,819	114,243	1,052,016	989,926
Rails, steel	70,998	86,708	1,018,615	743,337
Wheels, sleepers, fishplates and miscellaneous materials	138,873	183,551	1,250,372	1,601,277

Locomotive and rail exports included the following :—

	Locomotives		Rails	
	Oct., 1936	Oct., 1935	Oct., 1936	Oct., 1935
	£	£	£	£
Argentina	—	—	2,483	4,112
Union of South Africa	—*	—*	39,629	90,341
British India	723	10,746	13,854	75,957

* Figures not available

XUM

Railway Share Market

Home railway stocks showed a reactionary trend this week. This was partly a reflection of general market conditions, but the disappointing traffics were also an adverse factor, as were doubts regarding the outcome of the locomotive engineers' claim for increased wages. The aggregate decline of £45,000 in last week's traffic figures of the main line railways is due to the fact that comparison is still with the period last year when there were exceptionally heavy coal receipts. The market is now resigned to the view that for the remaining weeks of the year no material gains in the traffic figures are likely, and current estimates of earnings on the junior stocks are based on this assumption.

L.M.S. ordinary has gone back to 31¾, but the general belief is that about 1½ per cent. will be earned on the stock in 1936 and a dividend of at least 1 per cent. is expected. Both the 4 per cent. preference and 1923 preference made lower prices, but it appears that their dividends are being earned with a satisfactory margin and there is, of course, general confidence that their full dividends will be paid. Great Western ordinary was in demand earlier in the week on the better outlook for the Welsh coal trade, but later there was a rather sharp reaction to 62. A 3 per cent. dividend continues to be expected in this case, but it is realised that it will necessitate a further withdrawal from reserve, although lower than that in respect of 1935. Southern preferred was weak at 95½ and the deferred went back to 25, but in many quarters it is estimated that about ½ per cent. has been earned on the latter. L.N.E. issues were affected by the £39,000 decrease in the railway's traffics, which accounts for the bulk of the decrease in the aggregate figures of the main line railways for the past week. The second preference was lowered sharply to 28½, the first preference to 78½, and the deferred and preferred stocks also moved against holders. It is, however, possible that nearly ¾ per cent. has been earned on the second preference and its re-entry to the dividend list is still expected in some quarters. Metropolitan stock was lowered to 78½.

Central Argentine, B.A. Gt. Southern, B.A. Pacific and most of the other more active ordinary stocks of the Argentine railways received a fair amount of attention, but best prices were not held. Debenture stocks were in good demand on any decline in price. Cordoba Central first debentures were active. Elsewhere, San Paulo, Antofagasta and Nitrate Rails were lower. Canadian Pacific showed a relatively steady tendency. The 4 per cent. debenture has recovered the xd deduction.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

	Railways	Miles open 1935-36	Week Ending	Traffics for Week: Total this year	Traffics for Week: Inc. or Dec. compared with 1935	No. of Weeks	Aggregate Traffics to Date: Totals: This Year	Aggregate Traffics to Date: Totals: Last Year	Aggregate Traffics to Date: Increase or Decrease	Shares or Stock	Prices: Highest 1935	Prices: Lowest 1935	Prices: Dec. 2, 1936	Yield** (See Note)
				£	£		£	£	£					
South Central America.	Antofagasta (Chili) & Bolivia	834	29.11.36	19,330	+ 6,390	48	667,920	598,520	+ 69,400	Ord. Stk.	23	14 15/16	22	Nil
	Argentine North Eastern	753	28.11.36	9,835	+ 2,027	22	206,684	180,876	+ 25,808	,,	7	4	8 1/2	Nil
	Argentine Transandine	—	—	—	—	—	—	—	—	A. Deb.	49 1/2	30	52 1/2§	7 5/8
	Bolivar	174	Oct., 1936	5,900	+ 600	44	63,600	60,600	+ 3,000	6 p.c. Deb.	13	5	7 1/2	Nil
	Brazil	—	—	—	—	—	—	—	—	Bonds.	14	11	16	3
	Buenos Ayres & Pacific	2,806	28.11.36	78,706	+ 4,205	22	1,657,047	1,620,253	+ 36,794	Ord. Stk.	101 1/2	47 8	72 1/2	Nil
	Buenos Ayres Central	190	14.11.36	$154,500	+ $52,700	20	$2,841,200	$2,471,700	+ $369,500	Mt. Deb.	21	10	28 1/2	Nil
	Buenos Ayres Gt. Southern	5,084	28.11.36	128,353	+ 20,480	22	2,463,255	2,600,842	— 137,587	Ord. Stk.	27	13 1/2	26	Nil
	Buenos Ayres Western	1,930	28.11.36	51,294	+ 1,764	22	896,290	875,826	+ 20,464	,,	24	10	24	Nil
	Central Argentine	3,700	28.11.36	142,957	+ 27,919	22	3,020,974	2,578,193	+ 442,781	,,	17 7/8	7	25 1/2	Nil
	Do.	—	—	—	—	—	—	—	—	Dfd.	9	3 1/4	12	Nil
	Cent. Uruguay of M. Video	273	14.11.36	12,766	— 1,711	20	227,165	184,867	+ 42,298	Ord. Stk.	8 1/2	3	8	Nil
	Do. Eastern Extn.	311	14.11.36	2,662	+ 216	20	36,386	29,341	+ 7,045	—	—	—	—	—
	Do. Northern Extn.	185	14.11.36	1,177	— 200	20	27,102	22,552	+ 4,550	—	—	—	—	—
	Do. Western Extn.	211	14.11.36	1,064	+ 172	20	19,492	15,097	+ 4,395	—	—	—	—	—
	Cordoba Central	1,218	28.11.36	33,760	+ 4,150	22	708,780	677,570	+ 31,210	Ord. Inc.	4	1	3 1/2	Nil
	Costa Rica	188	Sept., 1936	14,195	+ 882	9	52,763	43,715	+ 9,048	Stk.	35	30	36	5 9/16
	Dorada	70	Oct., 1936	15,100	+ 3,200	44	141,700	117,400	+ 24,300	1 Mt. Db.	103 5/8	102 1/2	104 1/2	5 1/4
	Entre Rios	810	28.11.36	13,476	+ 2,642	22	278,678	254,410	+ 24,268	Ord. Stk.	15	6 1/2	12	Nil
	Great Western of Brazil	1,082	28.11.36	11,900	+ 3,300	48	380,000	369,700	+ 10,300	Ord. Sh.	1/2	5/16	1/4	Nil
	International of Cl. Amer.	794	Oct., 1936	$294,126	— $591	44	$4,223,770	$3,843,882	+ $379,888	—	—	—	—	—
	Interoceanic of Mexico	—	—	—	—	—	—	—	—	1st Pref.	1/8	3/32	1/8	Nil
	La Guaira & Caracas	22¾	Oct., 1936	4,305	+ 1,405	43	45,850	37,885	+ 7,965	Stk.	8 1/2	8	5 1/2	Nil
	Leopoldina	1,918	28.11.36	21,771	+ 2,515	48	943,775	859,871	+ 33,904	Ord. Stk.	8 1/2	2 1/2	7	Nil
	Mexican	483	21.11.36	$307,500	+ $17,600	21	$5,397,200	$5,120,200	+ $277,000	,,	1 1/2	1/4	5/8	Nil
	Midland of Uruguay	319	Oct., 1936	8,771	+ 2,167	18	32,198	22,939	+ 9,259	,,	1 1/2	1 1/2	1/2	Nil
	Nitrate	397	30.11.36	1,639	— 7,145	48	109,544	139,621	— 30,077	Ord. Sh.	64/-	42/-	21/2	Nil
	Paraguay Central	274	21.11.36	$2,434,000	+ $611,900	21	$53,495,000	$45,237,000	+ $8,258,000	Pr. Li. Stk.	80 1/2	60	78 1/2	7 5/8
	Peruvian Corporation	1,059	Oct., 1936	82,605	+ 112	18	339,051	299,665	+ 39,386	Pref.	10 5/8	6 7/16	10 1/4	Nil
	Salvador	100	21.11.36	c12,097	— c391	21	c234,108	c249,436	— c15,328	Pr. Li.Db.	65	61	15	Nil
	Sam Paulo	153½	22.11.36	32,175	+ 7,030	47	1,373,797	1,147,855	+ 225,942	Ord. Stk.	80	35	83	3
	Taltal	164	Oct., 1936	3,665	+ 275	17	12,420	12,640	— 220	Ord. Sh.	11 1/16	11/8	1 1/8	8 7/8
	United of Havana	1,353	28.11.36	14,495	+ 1,101	22	333,876	342,574	— 8,698	Ord. Stk.	3 1/16	1	2 1/2	Nil
	Uruguay Northern	73	Oct., 1936	1,162	+ 381	18	3,751	2,578	+ 1,173	Deb. Stk.	4 1/2	2 15/16	5 1/2	Nil
Canada.	Canadian National	23,613	21.11.36	777,521	+ 81,639	47	32,950,638	30,725,193	+ 2,225,445	—	—	—	—	—
	Canadian Northern	—	—	—	—	—	—	—	— 4 p.c.	Perp. Dbs.	78 5/8	52 1/2	74 1/8§	5 3/8
	Grand Trunk	—	—	—	—	—	—	—	—	4 p.c. Gar.	103 5/8	93	102 1/2§	3 7/8
	Canadian Pacific	17,220	21.11.36	547,000	+ 6,000	47	24,551,200	22,890,200	+ 1,661,000	Ord. Stk.	14 1/16	8 5/1	13 1/2	Nil
India.†	Assam Bengal	1,329	31.10.36	42,375	— 2,050	30	735,702	709,437	+ 26,265	Ord. Stk.	92 1/8	77 1/2	86 1/2	3 7/16
	Barsi Light	202	31.10.36	2,077	— 683	30	65,932	79 800	— 13,868	Ord. Sh.	105	77 1/2	66 1/2	7 1/2
	Bengal & North Western	2,112	10.11.36	76,060	+ 5,864	32	290,704	260,870	+ 29,834	Ord. Stk.	30 11 1/2	291	305	5 1/4
	Bengal Dooars & Extension	161	10.11.36	4,429	— 287	32	82,371	85,782	— 3,411	,,	127 1/2	122	120 1/2	5 15/16
	Bengal-Nagpur	3,268	10.11.36	171,225	+ 5,841	32	3,656,699	3,874,944	— 218,245	,,	105	100 5/16	101 1/2§	3 15/16
	Bombay, Baroda & Cl. India	3,072	20.11.36	207,225	— 34,875	34	5,122,500	4,987,500	+ 135,000	,,	115 1/4	110	110 1/2§	5 7/16
	Madras& Southern Mahratta	3,229	10.11.36	128,550	— 9,353	32	3,246,638	3,253,776	— 7,138	,,	128 1/2	113 7/8	110 1/2§	6 1/8
	Rohilkund & Kumaon	572	10.11.36	11,357	— 752	32	47,003	45,632	+ 1,371	,,	294	262	308	5 5/16
	South Indian	2,532	31.10.36	120,979	+ 14,720	30	2,379,315	2,361,387	+ 17,928	,,	119 5/4	104 1/4	103 1/2	5 5/16
Various.	Beira-Umtali	204	Sept., 1936	84,059	+ 24,443	52	803,277	769,888	+ 33,389	—	—	—	—	—
	Bilbao River & Cantabrian	15	Oct., 1936	977	— 718	44	14,608	15,053	— 445	—	—	—	—	—
	Egyptian Delta	620	10.11.36	9,456	— 1,272	32	148,404	144,301	+ 4,103	Prf. Sh.	2	15/8	1 3/4	5 11/16
	Great Southern of Spain	104	29.8.36	568	— 2,514	35	33,629	62,623	— 28,994	Inc. Deb.	3 1/2	2	3 1/2	Nil
	Kenya & Uganda	1,625	Oct., 1936	181,657	— 11,959	44	2,129,052	2,003,110	+ 125,942	—	—	—	—	—
	Manila	—	—	—	—	—	—	—	—	B. Deb.	48	36	46 1/2	7 1/2
	Mashonaland	913	Sept., 1936	120,223	+ 13,530	52	1,252,141	1,384,055	— 131,914	1 Mg. Db.	104 1/4	100	103	4 7/8
	Midland of W. Australia	277	Sept., 1936	14,970	+ 820	13	36,835	37,203	— 368	Inc. Deb.	98 5/4	93	96 1/2	4 1/8
	Nigerian	1,905	17.10.36	44,127	+ 15,934	29	869,343	671,029	+ 198,314	—	—	—	—	—
	Rhodesia	1,538	Sept., 1936	215,585	+ 22,258	52	2,291,219	2,320,250	— 29,031	4 p.c. Db.	105 1/2	101	105	3 13/16
	South Africa	13,263	7.11.36	633,665	+ 37,065	31	19,258,758	17,675,695	+ 1,583,063	—	—	—	—	—
	Victoria	4,728	June, 1936	703,693	+ 16,855	52	9,689,925	9,421,092	+ 268,833	—	—	—	—	—
	Zafra & Huelva	112	Sept., 1936	6,666	— 6,193	39	65,948	101,435	— 35,487	—	—	—	—	—

NOTE.—Yields are based on the approximate current prices and are within a fraction of 1/16.

† Receipts are calculated @ 1s. 6d. to the rupee. § ex dividend. Salvador and Paraguay Central receipts are in currency.

The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the Sterling weekly receipts at the par rate of exchange has proved misleading, the amount being overestimated. The statements from July 1 onwards are based on the current rates of exchange and not on the par value.